SCIENTIFIC AMERICAN

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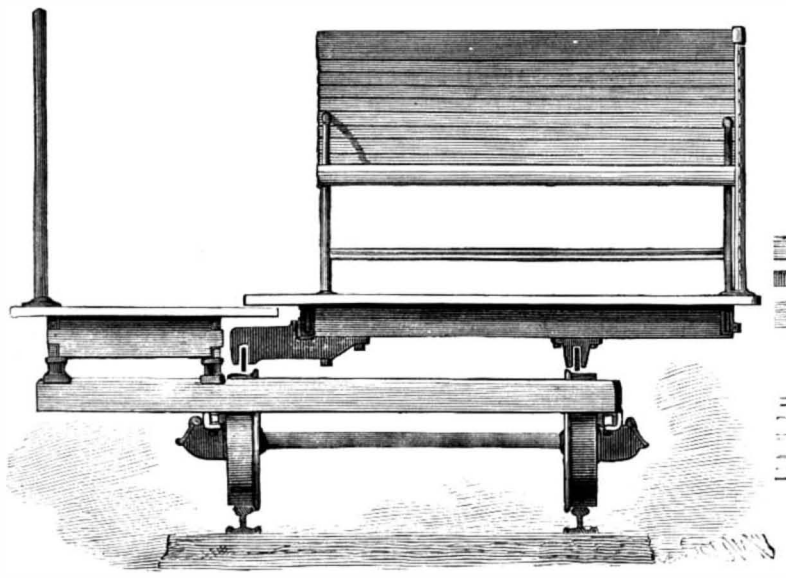
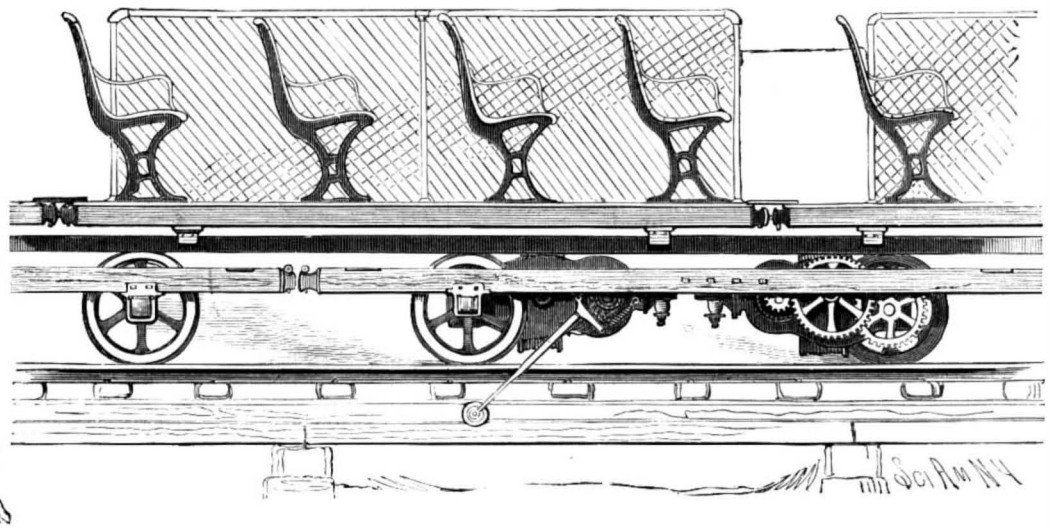
THE TRAVELING SIDEWALK.

On a section of the World's Fair grounds at Chicago there is now being operated, on an endless elevated railway track, elliptical in shape and 900 feet long, a traveling sidewalk, a portion of which moves at the rate of six miles an hour, while another portion by its side moves three miles an hour. The whole structure is under cover, as shown in the principal view below, and the system, which is a patented one, has been put in operation as a test of its practicability by a company of which Arnold P. Gilmore is president and O. Chanute vice-president. The slower-moving platform, as shown in the end view, is carried at one side on a frame of 2¼ inch by 6¾ inch pine sills, from the cross beams of which depend boxes in which are journaled the wheel axles, the wheels being 18 inches in diameter with 3 inch tread, and running on an ordinary T rail track of 3 foot gauge, while the faster-moving platform, extending slightly over the edge of the first one, is carried by two flexible steel rails resting directly upon the peripheries of the wheels. The rail is held



END VIEW OF MOVABLE PLATFORMS.



SIDE VIEW OF ELECTRIC MOTORS.

THE WORLD'S COLUMBIAN EXPOSITION—THE TRAVELING SIDEWALK NOW IN OPERATION.

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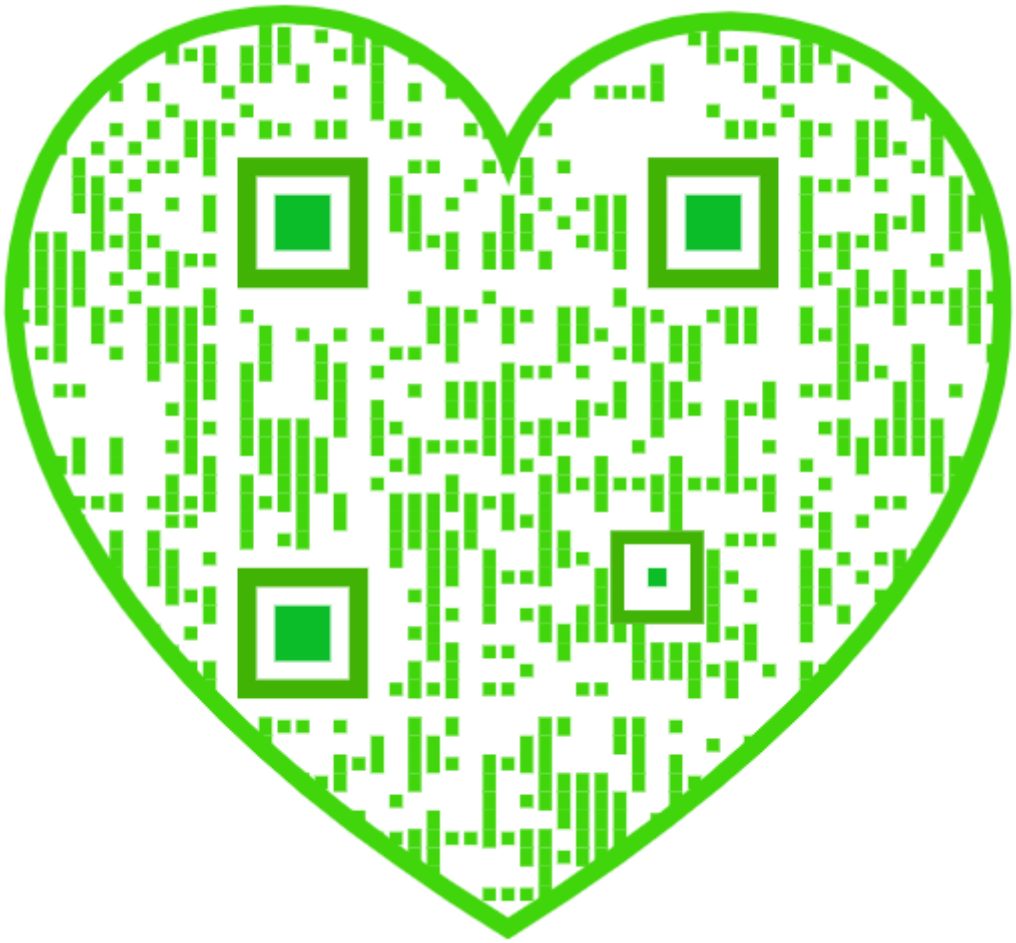

loosely in a shoe or socket in each cross beam, and the weight of the platform, whether loaded or empty, presses upon the rail sufficiently to give the necessary friction to move the load. The rails are of rolled steel, 4 inches high and half an inch thick, and are made in lengths of 30 feet, joined to make a continuous rail the entire length of the road.

The shoes are made of casehardened steel, and the rail slot has an opening of five-eighths of an inch, allowing an eighth of an inch play to the rail for lateral motion in rounding curves. The difference of speed of the two platforms arises from the fact that the top of the moving wheels, on which the flexible rail travels, has a forward motion twice as fast as that of the axles, from which the slower-moving platform is supported, and this ratio of one-half difference in speed of the two platforms would be maintained with wheels of any size. The platform moving at the rate of three miles an hour adjoins a stationary platform, from which one can step on to the movable platform without jar or inconvenience, as almost any one readily walks at this speed, while no greater change is felt in stepping from the slow to the faster moving platform, on which are stationary cross seats. There are gas pipe posts at intervals of 12 feet on the slower-moving platform, for the convenience of any one desiring such assistance in stepping from the stationary platform.

In this construction it will be noticed that the moving sidewalk and the sidewalk car do not stop at all, the differential speed allowing the passenger to readily and conveniently get off at any time, while the travel of the car is continuous, the passenger stopping himself instead of the car. With the six-mile continuous speed thus obtained it is claimed that this method offers great advantages for the moving of large crowds over short distances, where the traffic is constant, and this method has been proposed for transporting visitors about the Fair grounds during the Exposition period.

The motive power is electricity, furnished by a Thomson-Houston generator of 107 horse power. There are three trucks provided with two 15 horse power Thomson-Houston motors, each handling 25 platforms, the platforms being each 12 feet long, and each connected with its predecessor and trailer by an ordinary pin coupling. The current is conveyed by a trolley wheel and pole from the feed wire beneath the platform, the return current being through the rails. The greatest speed which has been attained on this test structure is eighteen miles an hour. The cost of constructing a sidewalk railroad of this kind is evidently far less than that of the usual elevated railroad, and, as there are no stops, the power required to operate it would probably be much less than half of that of the present system for the same volume of traffic. The section now running is said to be practically noiseless.

Improvements in the Manufacture of Aluminum.

The Thowless Aluminum Works, Newark, N. J., have lately begun operations in the production of aluminum under the process of Mr. Orlando M. Thowless. The success of the trials of the new method gives rise to the expectation that a new industry has been permanently established, which will rapidly assume great and important proportions.

By the new process the inventor makes metallic sodium from caustic soda, and makes it so cheap that it can be sold for 7 cents per pound, while it has so far sold for $1 per pound. In making the aluminum, the new process takes a quantity of caustic soda, and while it is in a heated state it is passed into a retort made of iron, and which has been previously charged with carbon, either in the form of gas retort carbon or commercial charcoal. An immediate disassociation takes place, forming a sodium vapor, which is allowed to pass off through a conducting pipe, and this vapor as it condenses forms the metallic sodium. In the next state in the process the aluminum material, which is cryolite or bauxite, and preferably the latter, is melted in clay crucibles until it is a bright red, when the metallic sodium is placed at the end of a long iron hook and dipped and stirred in the hot molten material until it has been melted too, and made part of the heated mass.

A rapid chemical action is the result, in which the aluminum is formed in the crucible, and after it is decanted into cold iron pots, the light metal rises to the top, and when cool it is separated and then recast into any desired shape or form.

Removal of Eugene Blackford from the New York State Fish Commission.

It is with much regret that we have to note the retirement of Mr. Eugene Blackford from the New York State Fish Commission. For twelve years Mr. Blackford has held this position without compensation of any kind and rendered inestimable services to the State in the matter of the preservation of its fish, care of the State hatcheries and similar work that fell to his charge. His practical knowledge of the subject and devotion to the objects of the commission it will not be easy to replace. His services have received the fullest acknowledgment from sportsmen and others interested in the preservation of game and food fish.

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THE AMERICAN CHEMICAL SOCIETY.

In the columns of the SCIENTIFIC AMERICAN have appeared notices of the three preceding general meetings of the American Chemical Society, that have been held respectively in Newport, Philadelphia, and Washington. It is therefore especially desirable that space should be given to the latest and the largest as well as the most representative gathering of chemists that has as yet been held in this country.

At the Washington meeting held in August last, immediately prior to the gathering of the American Association for the Advancement of Science, it was decided to convene a fourth general meeting in New York, on December 29 and 30. A committee of arrangements was appointed, of which Professor William McMuthrie was made chairman, and under his direction circulars and announcements were freely sent to chemists throughout the country.

On Tuesday morning, December 29, some fifty or more men gathered in the chapel of the University of the City of New York, and the meeting was formally called to order by the president of the society, Professor George F. Barker, of the University of Pennsylvania. The society was then made welcome to the University by its chancellor, Professor Henry M. McCracken, who referred to the fact that among the honored representatives of science who filled places in the faculty of the University were Leonard D. Gale, who was acting professor of chemistry at the time when Professor Morse, likewise a member of the faculty, was carrying on his experiment that led to the establishment of the electric telegraph. At a later period, John William Draper, the first president of the American Chemical Society, was connected with the University, as were also his two sons, John Christopher and Henry, both of whom are now dead. Professor Barker replied to this address in fitting words, and said that they were indeed in sacred precincts.

The usual business then followed, of which the most important act was the organization of a committee on the revision of the constitution. This committee, of which Professor George C. Caldwell, of Cornell University, was made chairman, has for its duties the revision of the constitution so that the New York Society may be formed into a local section and so that similar action may be taken by the Washington, Philadelphia, and Rhode Island sections.

The reading of scientific papers then followed. Those presented included: "On the Composition of Baryto-Calcite," by Dr. Charles W. Volney; "The Post-mortem Diffusion of Arsenic as the Result of Embalming," by Dr. Charles A. Doremus; "On Disulphotetraphenylene," by C. E. Lineburger; and "Notes on Water Analysis," by Hugh Hamilton. The society then adjourned its formal session and visits were made to Columbia College School of Mines, where Professor Charles F. Chandler received the scientists and conducted them through his museum of economic chemistry. Subsequently a visit was made to George Ehret's brewery, where, after a thorough inspection of the plant, the chemists were entertained in the reception room of the brewery with a lunch and samples of the beer.

The second session began on Wednesday morning, with the reading of a very able paper entitled "Advances in the Fractional Analysis of Silicates," by Prof. Frank W. Clarke, and followed by papers on "An Alchemical Chart," by Professor William P. Mason, and "The Properties of Matter considered as Periodic Functions of the Atomic Weight," by Professor Albert R. Leeds. A recess was then taken in order to partake of a luncheon which was provided for the visiting chemists by the courtesy of the authorities of the University.

On reassembling, various matters of business were taken up, including a request from Dr. Alfred Springer for a charter to establish a local section of the American Chemical Society in Cincinnati, which was granted. He also asked the society to recommend a standard method for the analysis of milk, but, after considerable discussion, it was decided, on motion of Professor Caldwell, that "it was inexpedient to indorse any particular methods of analysis." A motion was presented by Professor McMuthrie that "a committee of five be appointed by the chair to arrange for a general meeting of this society, to be held in Chicago, in the summer of 1893, and to offer the co-operation of this society to the authorities of the Columbian Exposition in arranging for an international congress of chemists." This was carried, after some interesting discussion, in which the representatives from Chicago took part, and Professor McMuthrie was duly named chairman of the committee.

An election for officers had been in progress during the morning, and the tellers announced the following result: For president, Professor George C. Caldwell, of Cornell University. For vice-presidents, Professor Edward S. Wood, of Harvard University; Dr. Charles B. Dudley, chemist of the Pennsylvania Railroad; Professor Edward Hart, of Lafayette College; Professor A. A. Breneman, of New York City; Professor Albert R. Leeds, of Stevens Institute of Technology; and Professor Elwyn Waller, of Columbia College School of

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Mines. For corresponding secretary, Professor Albert C. Hale, of Brooklyn. For recording, Dr. Durand Woodman, of New York. For treasurer, Charles F. McKenna, of New York. For librarian, Dr. Charles E. Munsell. For curators, Mr. John H. Wainwright, Mr. John Cawley and Dr. Thomas B. Stillman. The board of directors chosen consisted of Professor Robert W. Hall, Mr. Joseph F. Geisler, Dr. Albert P. Hallock, Dr. L. H. Friedburg, Mr. James H. Stebbins, Jr., and Professor William McMuthrie; and the advisory council named included Professor Frank W. Clarke, Dr. Alfred Springer, Dr. Harvey W. Wiley, and Professor George F. Barker. The committee on papers and publications elected consisted of Professor A. A. Breneman, Mr. Joseph F. Geisler, and Professor Albert C. Hale; and that on nominations to memberships of Professor A. H. Sabin, Dr. Albert P. Hallock, Dr. Lucius Pitkin, Dr. Charles A. Doremus, and Dr. William H. Kent. A communication from Professor Charles E. Munroe, with specimens showing some curious effects of zinc corrosion, was then presented, and after a series of resolutions expressive of thanks to the various institutions for permission to visit their plants were passed, the society adjourned.

During the afternoon visits were made to the College of the City of New York, to the works of the New York Oxygen Co., where the Brin process is in operation, and to the Equitable Gas Works at Forty-fourth Street and East River. In the early evening a reception was given to the visiting members at the Down Town Club, 62 Pine Street, followed by a banquet tendered by the chemical manufacturers of New York to the American Chemical Society, at which appropriate toasts were responded to by Professor George F. Barker, William H. Nichols, Professor Frank W. Clarke, Professor Charles F. Chandler and others. At the conclusion of the banquet the chemists visited, on invitation, the Pulitzer building and the *World's* composing and editorial rooms.

On the Effectual and Speedy Cure of Influenza.*

BY JOHN CRERAR, M.R.C.P. EDIN., ETC.

[In the course of his address Mr. Crerar said that he had formed a new theory of the treatment of acute infective diseases, based on the "analogy of nature," whereby is meant such an inference, for example, that the earth is globular, from observation of the uniform shape of the other heavenly bodies. Applying this to the study of micro-organisms, he infers that their life and reproductive activity depend upon their inhabiting suitable nutrient media under fit conditions.] Thus Klein tells us that a cubic centimeter of beef tea, kept in an incubator at a temperature of 98° F., and peopled by bacilli, multiplies its population 80,000 times in the first twenty-four hours, 450 times in the second twenty-four hours, and only five times in the third twenty-four hours. We thus find that, as the food supply becomes diminished, and the peculiar product of the fermentative process increased, the reproduction gradually declines and ultimately disappears. During the process of reproduction and growth of a micro-organism there is a peculiar substance excreted, or formed, which is baneful to its own microbe, and as this substance increases in quantity it diminishes the vitality of the microbe, and when it reaches a certain proportion it destroys the life of its microbe. When the yeast fungus is placed in an infusion of malt, it grows rapidly, at a suitable temperature, until the alcohol formed in its presence accumulates to 20 per cent of the whole quantity of the liquid; the alcohol then arrests the growth of the fungus, and the alcoholic fermentation proceeds no further. In the same way, Dr. Burdon-Sanderson has shown that the peculiar secretion of a bacillus is very destructive to the bacillus itself. These facts are of the highest importance when pathogenic fungi are considered in their relation to disease. The application of such facts to the treatment of infective diseases would, then, consist in bringing about in the system a change in the environment of the microbes analogous to that which is spontaneously effected by their own activity, since they apparently excrete products which in sufficient quantity are inimical to their own existence. Hence the possibility of a disease exhausting itself, as it were, without any treatment, provided that the vital powers of the patient can resist the poison more than the microbe that produces it.

It appears then, that we are continually liable to attack, but if we can by any means (and I think we can) so alter the state of the body as to make it intolerable to the minute invaders, we secure a valuable truce, and gain time to allow the organism to build up a vitality high enough to get beyond the reach of our remorseless foe, and we may thus save our patient. Hitherto the search for such a desirable agent has been chiefly carried on in connection with the cultivation and study of the pathogenic microbe. I propose to look for a similar substance in connection with the changes which invariably take place in the system of the patient during the acute stage of disease. I propose, in fact, to transfer a baneful and death-producing plant—the pathogenic fungus—from its congenial soil and climate in the tropics to the uncongenial soil and climate in the poles, and I confidently expect that, in its new situation, it will not long retain its power to do harm. I have practically applied this theory to the treatment of the influenza with the happiest results. In the epidemic of 1889 and 1890, I was face to face with an extreme case of this disease, when it was quite clear to me that something more than treatment upon general principles was necessary if I wished to save my patient. A process of reasoning, similar to what I have tried to explain, occurred to me at that time, and acting promptly on the indication to which it pointed, I artificially altered the prevailing state of the patient, with the result that the disease very speedily disappeared. I subsequently repeated my new line of treatment in hundreds of cases, with the same fortunate result. During the present epidemic (1891) I have pursued similar tactics with identically similar consequences. Let me briefly explain what has been occurring. I am called in to see a patient. I find him with a flushed, wo-begone face; intense frontal headache; increased temperature, at the same time perhaps that he is complaining of cold, or shivering; a quick pulse, great prostration, and unspeakable distress. I prescribe, and when I visit him next day I find all the acute symptoms gone; no distress, pulse and temperature normal, and the patient comfortable, but weak. On inquiry, he declares, in nineteen cases out of twenty, that the relief was obtained after the second dose of the medicine, that is, within four or six hours after the commencement of the treatment. Let me instance two cases as typical examples of many others.

Case 1.—Mr. T—— is extremly ill, and believes himself to be dying; pulse 117, with the other acute symptoms mentioned. I venture to assure him that he will be nearly well to-morrow. Next day I find him quite relieved, and the pulse reduced to 61.

Case 2.—A. F——, a young married woman, was taken very suddenly ill, and when I first saw her she was raving and could not be made conscious of my presence. The next morning she was well, but weak, and I was assured that the second dose of the medicine marked the time of the amendment. On the third day she was quite well, dressed, out of bed, and attending to her duties in the house.

But I have not yet stated the exact nature of my *modus operandi*. Very important results can be obtained through very simple means. In the days of Sir Thomas Watson, the most intelligent answer to the question, "What is the best cure for acute rheumatism?" would be, "Six weeks in blankets, aided by drugs administered on general principles." But the salicylate of soda has changed all that, and has given us a short cut toward getting rid of the excruciating tortures of acute arthritic inflammation of a rheumatic nature; and so with other affections. Having regard to the essential state of a severe attack of influenza, I conceived that I would get the most effective antagonism in greatly increased alkalinity, and the *bicarbonate of potash* was the first agent that I thought of. This salt has many advantages. It is not unduly stable, to make it difficult to break up in the system. It is also readily eliminated, and thus soon leaves the system; so that the danger of potash poisoning is reduced to infinitesimal proportions. Having found this salt to answer all my purposes, I have not looked for another, although, according to my theory, other remedies of a similar nature might easily give like results. I give liberal doses (thirty grains) in a teacupful of milk every two or three hours. I add a few drops of the tincture of capsicum, but this is not at all essential.

A word or two of caution. In two or three cases the action of the heart was weakened to an unpleasant degree; but digitalis and the aromatic spirit of ammonia quickly restored normality. Diarrhœa also sometimes supervenes, but is effectually met by Dover's powder. In cases where weakness was induced by previous disease, or where some other disease was a concomitant, or where pregnancy existed, the action of the remedy was somewhat retarded, but not rendered by any means less certain. Where the salt was intermitted too soon, the symptoms returned; but they readily gave way again on the resumption of the treatment. I trust that those who have the opportunity will test the accuracy of my statements by careful clinical observations, as I feel confident they will obtain equally favorable results; for the remedy acts uniformly and satisfactorily; *tuto, cito, et jucunde.*

* Being the substance of the presidential address delivered to the members of the Border Counties Branch of the British Medical Association, at the annual meeting held at Maryport, July 16, 1891.—*London Lancet.*

SAID Mr. Samuel before the Engineers' Club, Philadelphia: The best pavement for city traffic is one with an 18 inch concrete foundation, overlaid with a 2 inch plank flooring, thoroughly covered with asphalt on both sides, and, on top of these, cedar blocks set on end, with half inch joints filled with beach pebbles and asphalt. It gives a sure footing for horses, is comparatively noiseless and easily kept clean, and can be repaired in places without interrupting traffic or breaking up the rest of the street.

The Sick Room Temperature.

Physicians tell us the proper temperature of a sick room should be from 65 to 70 degrees Fah., and the heat should not go much below or much above these points. Abundance of fresh air and sunshine is the rule in all cases, except where the order of the physician prohibits the light. There is far more danger of the patient becoming enervated by close, foul air than there is from ventilation. English physicians insist that an open fire is a necessity to the proper ventilation of a sick room, and an eminent authority on this subject says: "I do not consider any room suitable for a patient to occupy during a prolonged illness where there is not an open fire burning on the hearth, in order to secure proper ventilation."

A tight stove or a furnace register will not serve any such purpose. On the contrary, the stove throws out a dry heat which can only be partly counteracted by keeping boiling water on the stove. It does not solve in any way the problem of ventilation. The furnace register too often brings up a current of foul air from the cellar or the kitchen, into which the cold air box opens. Unfortunately it is quite the exception to have the cold air box open outdoors, as it should. Even where it so opens, the furnace register does not assist materially in ventilating the room. One of the best methods of removing odors is to take a shovel of burning coals, sprinkle it with coffee and pass it around the room. Where there is infectious disease a deodorizing solution should be obtained from the physician and used in the water in which the utensils of the room, the bedding, and clothing of the patient are washed.

The Story of a Famous Mine.

The old Dickerson iron mine, located at Mine Hill, N. J., one of the oldest in the country, has been finally abandoned, owing to the unprofitable working of the mine at the depth reached. This mine has been worked almost constantly for about 175 years, and the vertical shaft has been sunk to a depth of over 1,000 feet.

There is quite an interesting history connected with this old mine as related in the *Manufacturers' Gazette.* The land above and around the mine was taken up as a mining tract in 1716 by John Reading, surveyor-general of the State, for Joseph Kirkbridge, who bequeathed it to his three sons. The first ore from the tract was worked from pockets at the surface, and was carried in saddlebags to Elizabeth, where it was made into bar iron, to be transported on horseback to a market. During the revolution ore from the mine was converted into cannon balls for the use of Gen. Washington's little band of fighters. The Dickerson family began to get possession of the mine in 1780, and in 1838 Gov. Dickerson was shipping ore by the Morris Canal to Pennsylvania furnaces. Before that period the mine was worked under the system of forge rights. The owner of a forge, or forge fire, who had an interest in the mine would go to Mine Hill and get out for himself all the ore he needed. Mining was easy enough, for the ore cropped out from the surface in large quantities. Its Indian name was Succasunna, or Zukkazuing, "place of the black stone."

During the days of forge rights the ore was carted to northern New Jersey to supply 100 or more forges. As legal tender was a scarce commodity in those times, the thirty or forty forgemen who worked at Mine Hill paid for the raw material with bar iron brought back from the furnaces or forges, and thus the Dickerson mine became a commercial center for crude and manufactured iron.

After Gov. Dickerson's death in 1853 the property was controlled by his nephews and nieces, but in 1860 business was so poor that they ceased working it, with a pile of 25,000 tons, then an enormous quantity, on the bank. Subsequently the mine was leased, new machinery was put in, and a boom was expected. Two years ago, however, an offset in the bottom of the mine threw the vein off so that it became lean and rocky and unprofitable. The mine produced about 1,000,000 tons of exceptionally fine ore.

Typesetting by Telephone.

The management of the London *Times* has utilized the telephone in a unique way. Telephone wires have been laid in the underground railway tunnel between the composing room in Printing House Square and the Parliamentary reporters' gallery in the House of Commons. A copy reader placed at the telephone reads the stenographic "turns" from the note book as fast as it is possible for the compositors to take them on their typesetting machines in the *Times* building, a mile and a half away. At first the reporters did not take kindly to the innovation, but when they found that they could dictate their notes direct to the composing room without the trouble of transcribing them, they began to look at the arrangement in an entirely different light. Proofs, of course, are sent to them for correction. Each machine can produce from five to six columns of solid minion a night. The *Times* is able to print in time for the 5 A. M. newspaper trains going to all points of the United Kingdom the whole of the debates, which are often continued until after 3 A. M.

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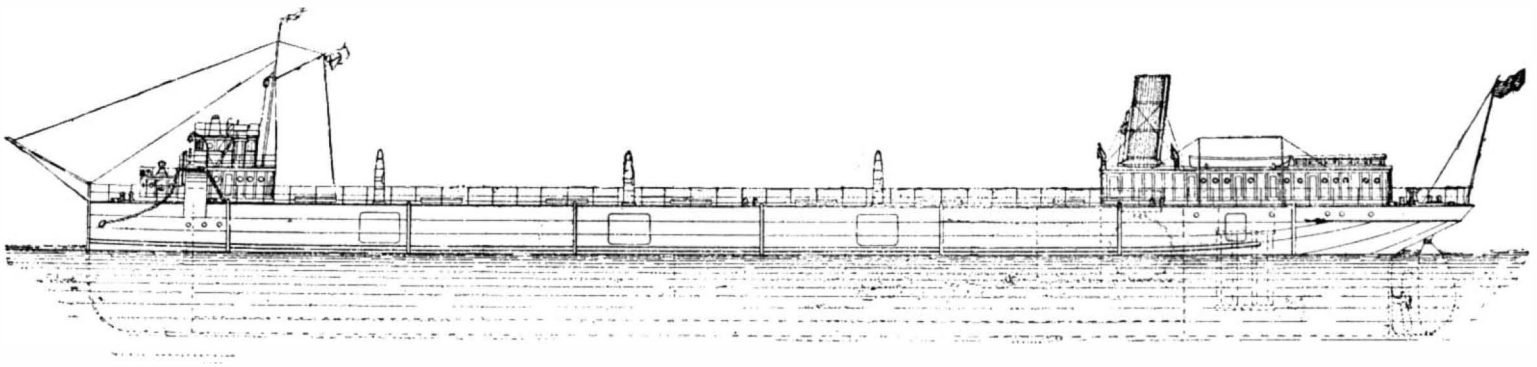
NEW LAKE STEAMERS.

A view of the style of boat for which the Anchor line has let contracts with the Union Dry Dock Company, of Buffalo, Globe Iron Works Company, of Cleveland, and Detroit Dry Dock Company, of Detroit, is here presented. According to a late change in arrangements above deck, the forward house will be moved aft about 20 or 30 feet, leaving the space forward for anchors, capstan, etc.

A new feature in the boats, which are to be duplicates in all respects, with the exception of probably a slight difference in the proportion of engines, is the absence of sheer in their construction. They will be built without any sheer, that is, they will be the same depth at ends as in the middle, and the gunwale will

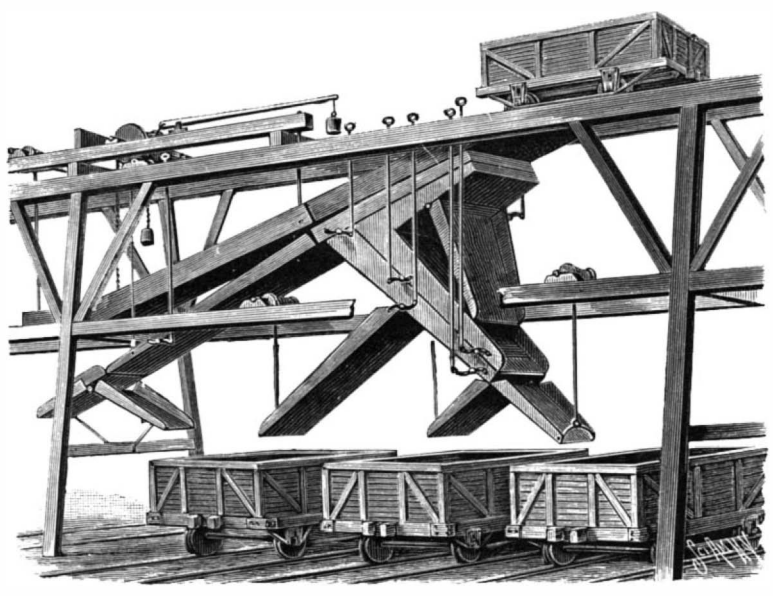


NEW LAKE STEAMERS.

be a bevel line. In this there is said to be a saving of $12,000 to $15,000 on boats of this class. The boats are to be 275 feet keel, 40 feet beam, and 26 feet depth from base line to top of spar deck beams at side. The boats to be built by the Globe Company, of Cleveland, and the Detroit Dry Dock Company will be engined by these companies, but H. G. Trout & Co., of Buffalo, will build the engines for the steamer to be built by the Union Dry Dock Company, and the Lake Erie Boiler Works, also of Buffalo, will build the boilers. The engines to be built by Trout will be 20, 33, and 54 inches by 45 inches stroke. The two boilers will be 12 feet long and 14 feet diameter, to be allowed 160 pounds of steam. The boats will have steam capstans, windlasses, steerers, and line shafting for hoisting purposes, together with electric lighting plants and all modern arrangements for rapid work in port. They are expected to carry 2,700 tons of freight on 15½ feet of water, and their cost is given out at $178,000 each.—*Marine Review.*

A TIPPLE FOR SEPARATING AND DELIVERING COAL.

The illustration represents an improved tipple for conveying nut or other fine coal to any desired car. It has been patented by Mr. Thomas B. Murphey, of West Elizabeth, Pa. The top chute, made in sections, is supported from a scale on top of the frame, and connected with a winding drum by a chain, the upper portion of the chute having screen bars. The chute below this has finer screen bars, and leading rearwardly from its upper portion is an angular chute, supported by a hanger, beneath which is another chute, with an extended end section, while opening from the latter chute is an adjustably supported branch chute. Opening from the upper portion of the angular chute is a swinging branch chute, at the upper end of which is a pivoted fly, controlled by a crank, from which a



MURPHEY'S COAL TIPPLE.

handle rod extends to the top of the frame. This branch chute delivers into the lower portion of the angular chute, and facilitates the rapid handling of the fine coal or slack. Near the lower end of the main section of the angular chute is a fly, having a crank connection with a rod leading to the top, and beneath this fly is another in the chute below, also having a crank connection with a rod leading to the top, the latter fly having a double crank, and the arrangement being such that the incline or grade of the chute may be readily changed. The two vertically aligning flies are placed in such relation to the swinging branch chute that, if both are opened, the coal will drop directly through the two fly openings. At a point above these flies is hinged another inclined chute, adjustably supported by a cable from a winding drum, and at the upper end of this chute is a fly operated by a handle rod, leading to the top, there being just over this fly a similar fly in the floor of the angular chute above, so that by opening both of these flies, and closing that of the first swinging branch chute, the coal may be delivered into another car, and, at the same time, be properly screened. Still another fly is also provided at the upper end of the chute, below the angular chute, for diverting the passage of the coal as may be expedient, the improvement providing for the convenient screening and sorting of the ordinary run of mine coal, and its delivery into different cars as desired.

Scientific Progress.

Intellect is the great factor in commercial success, whether of individuals or nations. Take the case of the skilled bricklayer and the hod carrier. The first is using brains on his work; the second is using brute force. When he goes up the ladder with his hod of bricks he has also to carry his own weight, thus wastefully expending force. Some one notices this, and substitutes for the brute force of the human that of the horse; then the horse is displaced by the mechanical force of the steam engine, which can do the work of 15 men or of 2 horses in the same time. Coal converted into heat is doing all the work. The coal mined each year in the United States represents in actual work more than the sum of the force of the total population of the globe, assuming all to be strong men. Thus the substitution of a natural force for human power vastly increases the productive capacity of the human race.

Guided by intellect, taught by science, the natural forces can do in a few hours what the unaided labor of many men could not do in a lifetime. It was not prophecy, but a flash of genius, that drew from Stephenson the assertion that it is the sun that drives the locomotive engine by being liberated from the coal in which it has been stored for ages. But man can neither create forces nor endow anything with properties. All that he can do is to convert and combine them into utilities. The man that does this with knowledge is spared the dismal failures of ignorance, but he that tries to use powers without understanding them is inevitably punished for his rash presumption. It is this presumption that causes the mortality and disease that follow in the wake of civilization. Natural law, like the civil, never admits ignorance as an excuse.

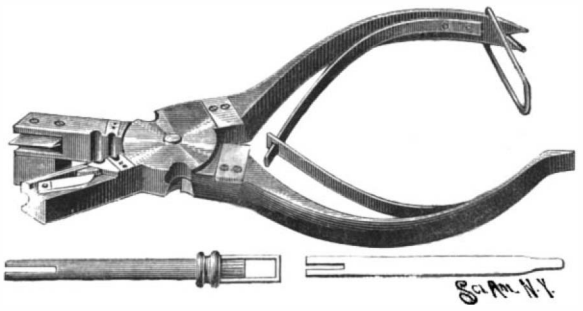
In this century three scientists have revolutionized commerce—Oersted, of Copenhagen, and Faraday and Wheatstone, of London. It was of Faraday that Huxley said, in effect, that any nation would do well to spend $500,000 in discovering such a man, and an equal amount in educating and setting him to work. Bessemer, studying away at steel, has revolutionized ship building. Dr. Joule's studies in the mechanical equivalent of heat produced the compound engine, by which the necessary amount of coal for carrying a given cargo has been reduced more than 40 times; that is, a steamship that in 1850 carried a cargo at an expenditure of 14,500 pounds of coal to a ton now does the same work by burning about 350 pounds. Joule's studies in heat have made it possible for a cube of coal that will pass through a ring the size of a twenty-five cent piece to drive one ton of cargo for two miles in one of the most improved steamships. In 1880 the rate of grain from New York to Liverpool was 9¼ pence; in 1886 it was 1 penny a bushel. The reduction was primarily due to the scientist.—*Aluminum Age.*

A Novel Advertising Scheme.

In racking one's brain for some device to catch the shy and wary customer, the following may serve as a suggestion. It is the story told by the *Sentinel*, of Indianapolis, of a druggist of that city. He found a stray nickel on the floor of his store one morning, and resolved to post this notice on the window of his store: "A sum of money found on Tuesday last in this establishment. The owner will receive same within upon describing the money." The scheme worked like a charm. Hundreds of citizens came in daily for over a week while the notice was left on the window, describing their losses and bewailing their misfortune. Invariably every applicant for the lost money bought a cigar. Some were satisfied with five cent straight whiffs, but the great majority, anxious to impress the drug man favorably toward their claims, invested in two for a quarter. So great was the rush that the fortunate druggist had to order a fresh consignment of choice brands. None of the applicants ever applied for the nickel.

A TOOL FOR MINERS AND BLASTERS.

The combination tool shown below has been patented by Mr. Richard A. McVitty, of Portland, Oregon, and is designed to embrace all the implements necessary for use in the treatment of fuses, or for the attachment of caps to fuses, or for inserting the capped fuse in a cartridge. The small view shows a fuse provided with a cap, and one end of a fuse compressed to enter a cap. The handles of the tool are normally held apart by



McVITTY'S MINERS' AND BLASTERS' TOOL.

interlocked springs, one handle member having a screw-driver point while the other is formed as a tack-puller, there being pivoted to the latter member a link adapted to be passed over the end of the other member. Near the pivot of the tool, in the handle section, are recesses in which are removably secured cutters, to be employed for trimming the ends of fuses, and at opposite sides of the pivotal connection in the outer edges are semicircular recesses, aligning when the handle sections are held apart, but having cutting edges for operating upon a fuse or for cutting wire when the handle sections are brought toward each other. In the upper face of the head section of one member is a horizontal recess, in which is pivoted a knife blade, held in position by a spring after the manner of an ordinary pocket knife. In the inner faces of both head sections are longitudinal semicircular grooves, in one of which a cutter is removably secured, the grooves and the knife being adapted to cut the end of a fuse, as shown in the small view, to facilitate lighting the fuse. Nearer the pivotal point, in the inner faces of the head sections of both members, are two transverse recesses, one of which is adapted for use in crimping ribs upon a cap, to fasten it on the fuse, while the other is for reducing, by compression, the end of a fuse to be inserted in a cap. Each head section also has a downwardly extending lug, capable of use as a hammer.

Chromic Acid an Antidote to Snake Poison.

Prof. Kaufman, of the Veterinary College at Atfort, has discovered that chromic acid, used hypodermatically, will destroy the poison of snakes and other venomous reptiles.

The treatment consists in the cautious employment of a one per cent solution by the ordinary hypodermatic syringe; and, at the same time, where the bite happens to be at one of the extremities, the limb should be ligatured, in order that the medicament may have an opportunity of being diffused throughout the tissues.

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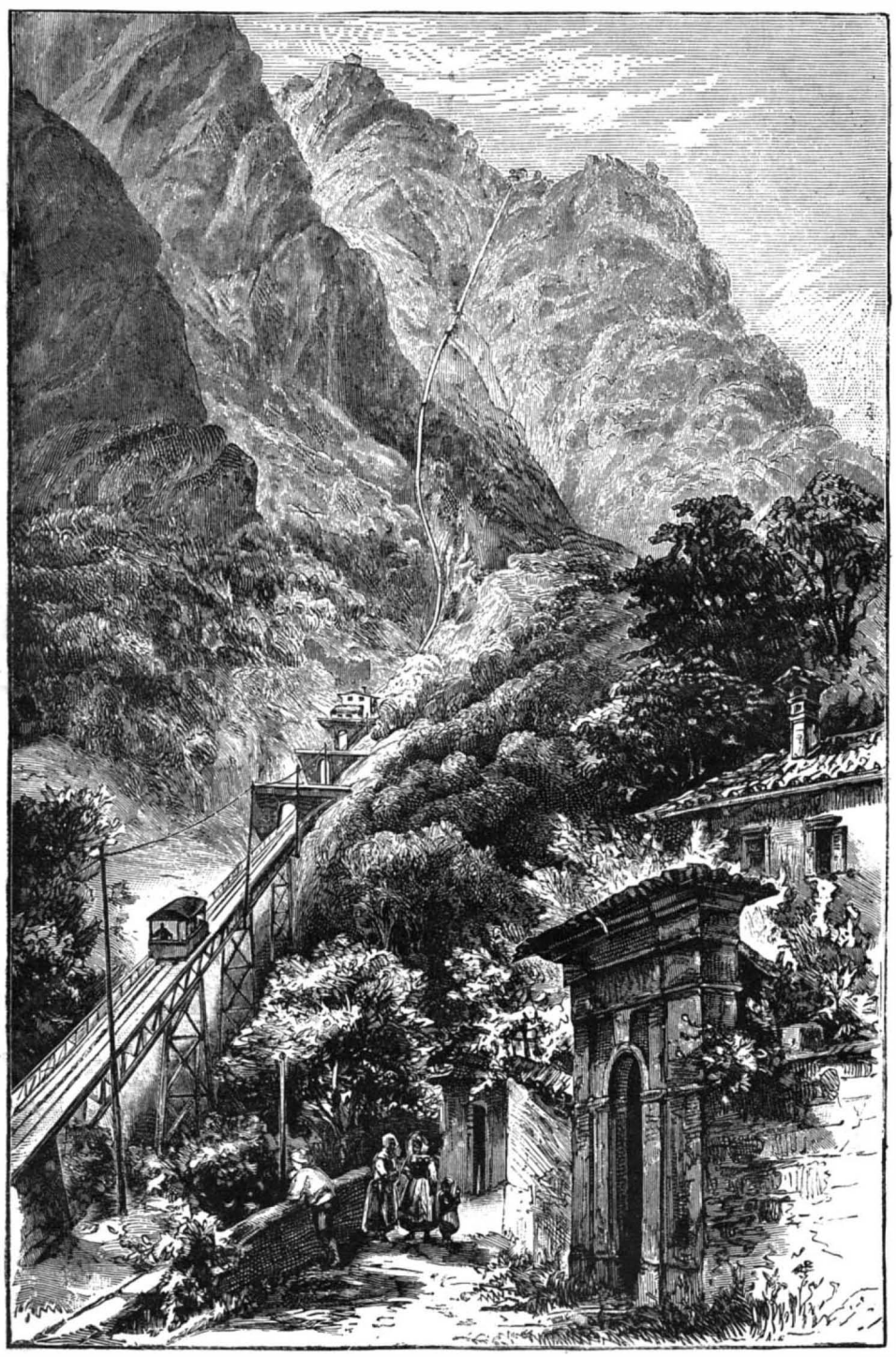
THE CABLE ROAD ON MOUNT SAN SALVATORE, NEAR LUGANO.

If we stroll along the banks of the beautiful lake at Lugano, opposite us rises a steep and rocky mountain, San Salvatore, which constitutes the most striking feature of the landscape, being even more prominent here than Mt. Pilatus at Lucerne, or Saleve at Geneva; because, when we look across Lakes Lucerne and Geneva, these high mountains lie at one side, while San Salvatore is directly opposite us, at Lugano, forming, as we have said, the most noticeable object in that charming region at the southern foot of the Alps, and adding greatly to the beauty of the scene by the light effects which it causes. In the early morning, when the twilight still hangs over the water, San Salvatore is brilliantly lighted; after the sun has passed the meridian it darkens, throwing its shadow over the lake; and at sunset it shows faintly between two streams of strong light that fall to the right and left of it, casting a golden light on the water and the mountains which rise from the eastern shore. If we look toward it in the moonlight, it stands out darkly like a gigantic bell, the soft



THE GREAT VIADUCT OF SAN SALVATORE.

lines of which are lost in the waves of the lake. It is easy to understand why this mountain, crowned by the little Church of the Redeemer, has such charms for visitors at Lugano, and even for the inhabitants of the place, on such a night. On certain fete days the people go from Lugano to the service at this church—a short introduction to a long day of pleasure on the top. Tourists find great delight in ascending San Salvatore, for, although it is not difficult, there are so many rough places and steep rocks that one who has reached the top feels justified in claiming to have climbed a real mountain.

For some years past the pleasure of a trip to the top of this mountain has been greatly enhanced by the cable road. It runs up the northern slope and looks from Lugano like a deep cut in the green mountain. The station from which the trains start is in a suburb of Lugano, rightly named Paradise, and can be reached from the city in twenty minutes. The road is more than a mile long, and the station at the top is 1,978 feet above the starting point. This upper station is 2,903 feet and the summit of the mountain 2,982 feet above the level of the sea. At the beginning the grade of the road is 17 per cent, at the elevated hamlet of Pazzallo it is 38 per cent, and at the upper station not less than 60 per cent. The lower part of the road is cut through a bank of earth, but the upper part is cut deep in dolomite rock. The halfway station lies at a height of 1,604, and here is the electric motor for raising the cars. The power is obtained from a head of water on the other side of the lake. It is brought over the dam at Melide on the right shore, and from there is carried up the mountain to the village of Ciona and to the motor station. Besides the electric motor, there is a steam engine to be used in case of accident to the former. This road and that on the Burgenstock, not far from Lucerne, are the work of Bucher & Durrer, of Kagiswyl, in the Canton of Unterwalden.

Where the road begins the view of the country at the foot of the mountain is charming, and, as the train moves upward, it becomes more extensive every minute, spreading before us the heights of the region. The view from the upper station is grand, but from the little church on the summit it is wonderful, for the church stands on the edge of the precipice toward the lake. Over the confusion of lower mountains rise the snow-capped peaks which border the horizon, and at our feet the most beautiful lake region of the Alps, Lugano and the villa-covered chain of hills, the so-called Collina d'Oro. The charm of these mountains lies in their moderate height. We do not feel, by any means, that we are in the kingdom of the vulture and the eagle, for, from Lugano and its surroundings, we hear the rumble of wagons, and the sound of the Italian bells floats up to us; and over the dam of Melide we see the Gotthard train on its way to the plains of Lombardy, and on the steamboat that plows through the waves of the lake, far below us, we discern the groups of passengers and the joyfully waving flags.

The traveler who visits the upper Italian lakes and stops at Lugano should not fail to ascend San Salvatore.—*Illustrirte Zeitung.*

THE SUMMIT OF THE MOUNTAIN, WITH THE CHAPEL.

The Baku Pipe Line.

Mannesmann high pressure tubes have been laid, by Dr. W. Von Siemens, for pumping petroleum a distance of 14½ miles and to a height of 3,300 ft. The pipe line runs from Baku, on the Caspian Sea, westward, is 4 in. in diameter, and the lengths are connected by the conical screw thread joint of the American type cut by an American machine. These Mannesmann steel tubes are laid directly on the surface, except at road crossings. The pumping pressure is nearly 90 atmospheres, 1,350 lb. to the square inch, and there is said to be no leakage.

Fireproofing of Tissues.

At the Berlin exhibition of means and contrivances for the prevention of accidents in industries and otherwise, prizes were awarded for the following processes of fireproofing, respectively, diminishing the combustibility of tissues, curtain materials, and theatrical scenery, viz.:

1. For light tissues: 8 kil. pure ammonium sulphate, 2½ kil. pure ammonium carbonate, 2 kil. pure borax, 3 kil. boric acid, 2 kil. starch, or 400 grammes dextrin, or 400 grammes gelatine, and 100 kil. water are mixed together, heated to 30° C., and the material impregnated with the mixture, centrifugated and dried, and then ironed as usual. One liter of the mixture, costing about 3 or 4 cents, is enough to impregnate 15 yards of material.

2. For curtain materials, theatrical decorations, wood, furniture: 15 kil. ammonium chloride are mixed with so much floated chalk as to give the mass consistency; it is then heated to 50—60° C., and the material given one or two coats of it by means of a brush. A kilogramme of it, costing about 4 to 5 cents, is sufficient to cover 5 square yards.

3. For wood, cordage, straw matting, packing cloth: 15 kil. ammonium chloride, 6 kil. boric acid, 3 kil. borax, are dissolved in 100 kil. water, the material laid down in the solution for 15—20 minutes at 100° C., squeezed and dried. One liter costs about 5 cents.

4. For paper, printed or not: 8 kil. ammonium sulphate, 3 kil. boric acid, 2 kil. borax, are dissolved in 100 kil. water, and the solution applied at 50° C.

Attraction of Pile Driving.

What is there, asks the *Evening Journal* (Jersey City), in a pile driver, or its operation, that stimulates human curiosity to such a noticeable degree? The putting up and setting in operation of a pile driver anywhere is sure to immediately draw a crowd, and keep a considerable portion of the people who compose it standing idly by to watch the monotonous repetition of the movement of the pile driver's simple machinery and heavy weight, which is drawn up and then let go, to come down with a thud on the top of the unoffending and helpless stick of timber, driving it every time a few inches deeper into the mud. Wherever this operation is going on, you will see a crowd of from a dozen to one hundred and fifty men and boys, who appear to take as much interest in it as they would in a Punch and Judy show or a dog fight. We do not understand where the curiosity-exciting element is. After one has seen the big thumper go up and come down once he has seen all he ever will see of the mystery of pile driving. Yet crowds of idlers are found hanging around the pile driver's station for hours. Are these people really curious, or are they only lazy and loafing?

As one result of the English protectorate in Egypt, new irrigation works have been pushed in all directions, and the agricultural productions of the country greatly increased. Last year four hundred millions of pounds of cotton were produced in Egypt, being nearly one-quarter of the entire quantity consumed in Great Britain.

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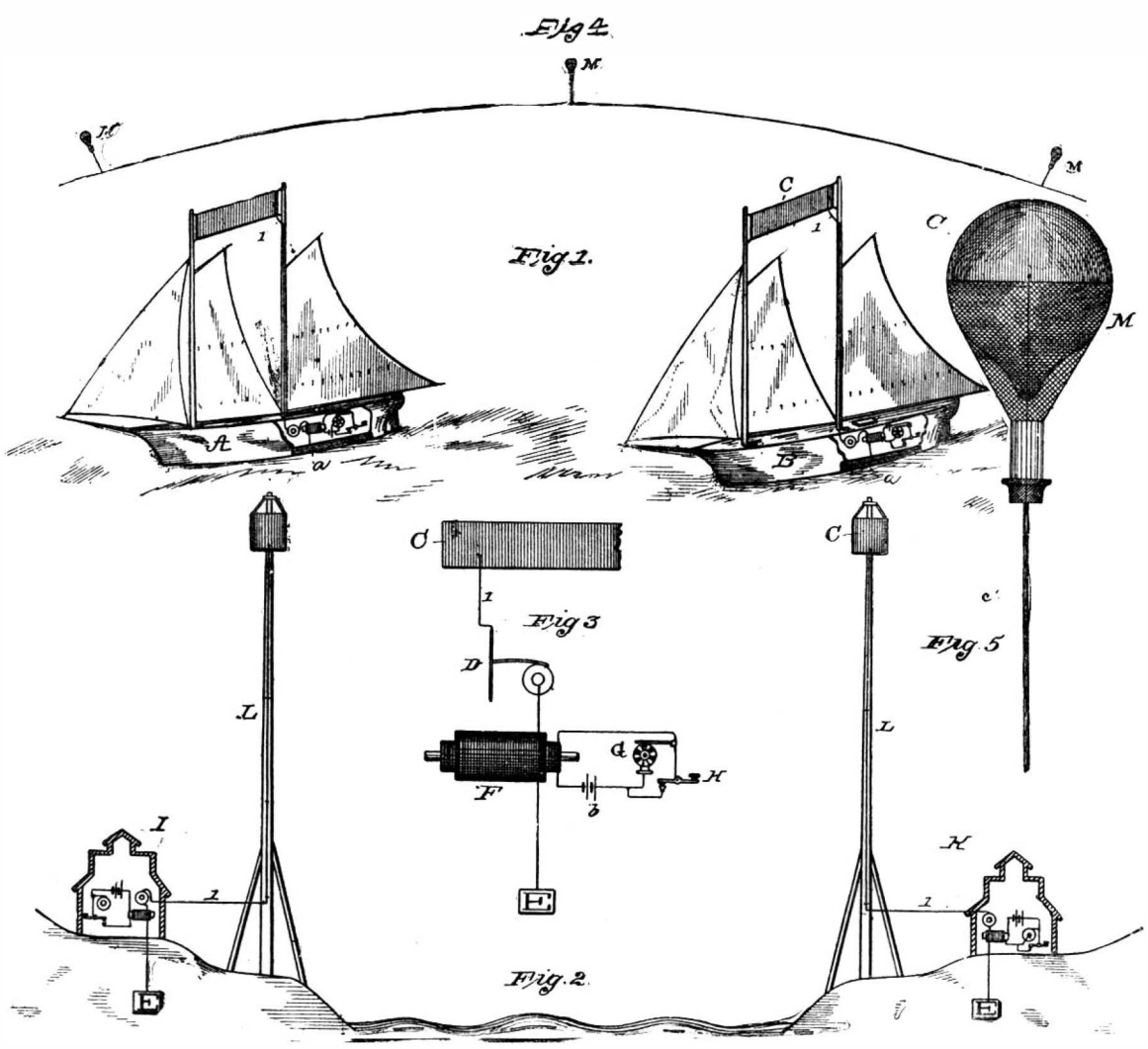
TELEGRAPHING WITHOUT WIRES.

Among the recent patents is one by Thomas A. Edison, of Menlo Park, N. J.—means for transmitting signals electrically, without the interposition of connecting wires. In his specification he says:

"I have discovered that if sufficient elevation be obtained to overcome the curvature of the earth's surface and to reduce to the minimum the earth's absorption, electric telegraphing or signaling between distant points can be carried on by induction without the use of wires connecting such distant points. This discovery is especially applicable to telegraphing across bodies of water, thus avoiding the use of submarine cables, or for communicating between vessels at sea or between vessels at sea and points on land; but it is also applicable to electric communication between distant points on land, it being necessary, however, on land (with the exception of communication over open prairie) to increase the elevation in order to reduce to the minimum the induction-absorbing effect of houses, trees, and elevations in the land itself. At sea, from an elevation of 100 feet, I can communicate electrically a great distance, and since this elevation, or one sufficiently high, can be had by utilizing the masts of ships, signals can be sent and received between ships separated a considerable distance, and by repeating the signals from ship to ship communication can be established between points any distance apart or across the largest seas, and even oceans. The collision of ships in fogs can be prevented in tension are produced at the elevated condensing surface, producing thereat electrostatic impulses. These electrostatic impulses are transmitted inductively to the elevated condensing surface at the distant point and are made audible by the electromotograph connected in the ground circuit with such distant condensing surface. The intervening body of air forms the dielectric of the condenser, the condensing surfaces of which are connected by the earth. The effect is a circuit in which is interposed a condenser formed of distantly separated and elevated condensing surfaces with the intervening air as a dielectric.

In the accompanying drawings, forming a part hereof, Fig. 1 is a view showing two vessels placed in communication by my discovery; Fig. 2, a view showing signaling stations on opposite banks of a river; Fig. 3, a separate view, principally in diagram, of the apparatus; Fig. 4, a diagram of a portion of the earth's surface, showing communication by captive balloons; Fig. 5, a view of a single captive balloon constructed for use in signaling.

A and B are two vessels, each having a metallic condensing surface, C, supported at the heads of the masts. This condensing surface may be of canvas covered with flexible sheet metal or metallic foil secured thereto in any suitable way. From the condensing surface C a wire 1 extends to the hull of each vessel and through the signal receiving and transmitting apparatus to a metallic plate *a* on the vessel's bottom.



EDISON'S NEW METHOD OF TELEGRAPHING WITHOUT WIRES.

by this character of signaling, by the use of which, also, the safety of a ship in approaching a dangerous coast in foggy weather can be assured. In communicating between points on land, poles of great height can be used, or captive balloons. At these elevated points, whether upon the masts of ships, upon poles or balloons, condensing surfaces of metal or other conductor of electricity are located. Each condensing surface is connected with earth by an electrical conducting wire.

On land this earth connection would be one of usual character in telegraphy. At sea the wire would run to one or more metal plates on the bottom of the vessel, where the earth connection would be made with the water. The high resistance secondary circuit of an induction coil is located in circuit between the condensing surface and the ground. The primary circuit of the induction coil includes a battery and a device for transmitting signals, which may be a revolving circuit breaker operated continually by a motor of any suitable kind, either electrical or mechanical, and a key normally short-circuiting the circuit breaker or secondary coil. For receiving signals I locate in said circuit between the condensing surface and the ground a diaphragm sounder, which is preferably one of my electromotograph telephone receivers.

The key normally short-circuiting the revolving circuit breaker, no impulses are produced in the induction coil until the key is depressed, when a large number of impluses are produced in primary, and by means of the secondary corresponding impulses or variations This wire extends through an electromotograph telephone receiver, D, or other suitable receiver, and also includes the secondary circuit of an induction coil, F. In the primary of this induction coil is a battery, *b*, and a revolving circuit breaker, G. This circuit breaker is revolved rapidly by a motor (not shown), electrical or mechanical. It is short-circuited normally by a back point key, H, by depressing which the short circuit is broken and the circuit breaker breaks and makes the primary circuit of the induction coil with great rapidity. This apparatus is more particularly shown in Fig. 3.

In Fig. 2, I K are stations on land, having poles, L, supporting condensing surfaces, C, which may be light cylinders or frames of wood covered with sheet metal. These drums are adapted to be raised and lowered by block and tackle, and are connected by wires with earth plates through signal receiving and transmitting apparatus, such as has already been described.

In Fig. 5, M is a captive balloon having condensing surfaces C of metallic foil. The ground wire 1 is carried down the rope *c*, by which the balloon is held captive. In Fig. 4 three of these captive balloons are represented in position to communicate from one to the other and to repeat to the third, the curvature of the earth's surface being represented."

Several claims are made, but the principal one is the following:

"I claim as my discovery means for signaling between stations separated from each other, consisting of an elevated condensing surface or body at each station, a transmitter operatively connected to one of said condensing surfaces for varying its electrical tension in conformity to the signal to be transmitted, and thereby correspondingly varying the tension of the other condensing surface, and a signal receiver operatively connected to said other condensing surface, substantially as described."

New Discovery of Clymenia.

John M. Clarke describes in the *American Journal* for January the fossil *Clymenia* discovered in the fauna of the intumescens zone (Naples beds) of Western New York. The ammonoid genus *Clymenia* Munster has not heretofore been found in North America. As early, however, as 1843, Professor Hall doubtfully referred to this genus, a fossil from the Portage shales, the *Clymenia* (?) *complanata*, and in 1862 redescribed the species without the mark of doubt, at the same time adding a new specific name, *C. Erato*, for a fossil from the same fauna. Subsequently these fossils were proved to be of the same species, and though the name *Clymenia* was still retained as late as 1876, it was finally and quite properly abandoned in 1879.

The present discovery of a true *Clymenia* in a lower Upper Devonian fauna containing *Goniatites intumescens* and various other primordial goniatites was unexpected and is of considerable geological importance.

AN OVERSHOE ATTACHING DEVICE.

An improvement designed to facilitate the securing of rubber or other overshoes in a rapid, convenient, and firm manner on the boots or shoes of men, women or children is represented in the accompanying illustration, and forms the subject of a patent issued to Mr. Joseph H. Morison, of Centralia, Kan. It is an attachment consisting of a pair of pivoted opposite lateral clamps, adapted to hug the upper heel-end portion of the overshoe, and jointed together at their inner ends by a vertical hinge pin passing through an intermediate or center plate firmly secured to the overshoe. The center plate has a backwardly protruding

MORISON'S OVERSHOE ATTACHMENT.

lug, through which and two side arms of a clamping lever passes a fulcrum pin. The side arms of this lever are practically cams, and as the lever is pressed downward against the heel of the shoe the arms press the clamping wings inward, making the heel-end portion of the overshoe bind on or grip the under boot or shoe, to prevent the accidental withdrawal of the overshoe or its slipping off in muddy or sticky roads. To put on or take off the overshoe the central member of the lever is turned up, releasing the pressure upon the clamping wings, but, in putting on the overshoe, a single motion of the clamping lever, made by either the hand or foot, locks the overshoe on the under boot or shoe.

A Proposed Ship Canal around the Falls of Niagara.

A bill has been introduced in Congress by Senator Davis, of Minnesota, for the construction of a ship canal around Niagara Falls which provides that the canal shall be built "along and upon one of the routes for a ship canal heretofore surveyed by the United States, if either of such routes shall be deemed feasible."

The report says: "Were this route open into Lake Ontario, vast numbers of lake steamers could and would descend to the Atlantic Ocean and there engage in the carrying trade in the winter months. That experiment has been repeatedly demonstrated beyond all doubt, and that, too, by vessels of less than six hundred tons burden. Ocean steamers as well as sail vessels could be constructed on the lakes cheaper than elsewhere, because all materials for construction as well as provisions are cheaper there than on the seaboard. This would at once solve the problem so long and anxiously sought after by statesmen as well as commercial men, to wit, revive commerce and cheapen transportation from the interior, so that our agricultural products could be carried to Europe at a profit, and there would no longer be a complaint of a languishing commerce."

THE "Physicians' Visiting List" for 1892, published by P. Blakiston, Son & Co., Philadelphia, besides the daily memorandum pages, contains much information useful to medical people.

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The New Gas Works, Memphis, Tenn.

The *Appeal-Avalanche* says:

"I propose to throw in the first shovelful of coal," said Col. N. M. Jones.

"I think I deserve that honor," interposed Captain D. F. Jett.

A bystander was appealed to, who tendered the very just decision as between the friendly rivals that both should throw in a shovelful at once, and neither would have the advantage.

This pleasant episode marked a new era in the gas-making industry in Memphis.

President N. M. Jones, Secretary D. F. Jett, and Superintendent and Secretary J. T. Lynn, of the Memphis Gas Light Co., stood, on Monday, Nov. 30, 1991, in front of the great brick "bench," a technical term that refers to what appears to one unacquainted with the business to be a brick wall studded with doors like the openings to furnaces in a boiler room. These doors are the entrances to the retorts, which at the time and place referred to were clean and new, but white with a heat communicated from the furnaces below.

The Memphis Gas Light Company had just finished the work of putting in a new plant, and the interesting point of firing the first retort was reached.

The firing of the first retort of a gas works is the most interesting episode in the history of such an establishment. It is like turning the first dirt on a railroad destined at some day to carry on the commerce of a continent, or like touching the button which, by electrical communication, starts in operation the machinery of some great exposition of the world's products. It is an honor to be the individual favored with the task of throwing in the first coal.

It was for this honor that the president and secretary of the Memphis Gas Light Company contested, in a friendly way, in the words set forth at the beginning of this story; and a bystander, being a man of resource, settled the dispute between the others in the satisfactory manner hereinbefore set forth.

Messrs. Jones and Jett fired the first retort at 3:30 o'clock on Monday afternoon, and thus the new plant was launched upon its useful career of furnishing the finest quality of gas ever known in these parts.

The Memphis Gas Light Company has been lighting streets and houses, heating rooms and cooking meals of Memphis people for forty years, and each year has brought improvements and enlargements to meet the demands and satisfy the desires of its patrons; but this last great change has been the greatest since the first construction of the plant, embracing, as it does, a complete new machinery, from the coal chute, where the material for the manufacture of gas is first taken in, to the immense holders, where the perfect gas is confined before it is pressed into the mains to go out for the illumination of the city. The history of this company has been the history of the city. Forty years ago it started with a capital stock of $100,000; to-day its capital stock is $750,000. In 1851 it had 10 miles of mains; in 1891 it had over 40 miles. The plant was at first only large enough to accommodate its comparatively small patronage, but to-day it is the largest and most complete in the South, covering an entire block of ground, between Main and Chickasaw, Mill and Greenlaw Streets.

The improvements that have just been completed were begun last June, and have cost the handsome sum of $150,000. Up to last June the company had been supplying coal gas. It was then found necessary, owing to the dilapidated condition of the benches in which the retorts were situated, to make thorough repairs, and it was decided to remodel the plant throughout, securing the best and latest improved machinery in order to supply the finest quality of gas and to be ready to make extensions of the service whenever necessary. To this end it was necessary to go into the manufacture of water gas temporarily, pending the completion of the new system, and, since June, the water gas has been supplied to patrons of the Memphis company, a very good gas in its way, but not to be compared to the article which will be produced by the new system, which will be a combination of three parts of coal and one part water gas, which has been found better than any other by actual experiment, and is in use in the principal cities of the North, including New York, Chicago, St. Louis, Detroit, Pittsburg, Buffalo, Cleveland, and other leading cities. The water gas manufacture necessitated the use of two cupolas, which were put in, and which will still be used for the water portion of the new combination.

On July 15 the company began the task of repiping the entire city, and so rapidly has the work been pushed that already over 40 miles of new mains have been laid, including 20 miles of 16 and 12 miles of 8 inch and 6 inch pipe.

At the plant on Mill Street, entire new machinery has been put in, including a coke house, where three different qualities of coke can be put in; a $400 automatic pressure valve, by which the pressure can be regulated so that the same pressure will be given at the extreme limit of the mains as right at the gas works; a $6,000 meter, through which all the gas runs, and is measured; an $8,000 standard washer scrubber for ammoniacal liquor; a tar extractor under cover. In fact, the new machinery includes everything that goes to make a perfect and complete gas works, and the arrangements are not only for the present, but contemplate extension of the service whenever it is necessary.

A trip to the Memphis Gas Light Company's plant is a pleasant and instructive experience. It is not as disagreeable a place as people are inclined to imagine who pass by on the outside and get a whiff of the escaping liquid. Inside the inclosure everything is kept as clean and neat as a lawn, and th smell of escaping gas is not perceptible. Every gas manager takes a pride in the cleanliness and neatness of the establishment over which he presides, and when a reporter for the *Appeal-Avalanche* dropped unexpectedly into the area formed by the numerous large buildings belonging to the Memphis Gas Light Company yesterday afternoon, he was much surprised at the pleasing aspect of the place. Not a leaf or a stone is permitted to lie upon the ground outside the buildings, and inside the machinery and apparatus are kept clean and bright, with that scrupulous regard for the attractive that guides the locomotive engineer in the burnishing of the machinery under his care.

"You want to see how gas is made?" said Superintendent Lynn, who was found at his post of duty, watching the finishing touches being put on some of the new apparatus.

"Then come with me. First you ought to know how we get our coal, for the getting of the coal is the *sine qua non* of this business, as the catching of your turkey is the great desideratum to an orthodox Thanksgiving dinner. Our coaling arrangements are beyond improvement. You see the bayou runs alongside the yard, and barges loaded at Pittsburg are floated right up to our coal sheds, and the cargoes are lifted out by means of a derrick."

The genial superintendent showed how the coal was conveyed from the sheds to the retorts on trucks which were wheeled into the main building and lifted with their loads by means of a hydraulic elevator to the platform upon which the retorts open.

The retort is where the gas is first separated from its natural abode, the coal, and possesses, therefore, great interest to the student of gas making. The retorts at the Memphis Gas Company's plant are tunnels 22 feet 6 inches long and 17 inches by 30 inches in size, constructed of fire clay. There are twelve such retorts. They open at both ends and run through an immense brick framework termed a bench. Beneath the retorts are the furnaces, and around them are open spaces. The retorts are so high above the floor that a platform has been erected, so that the furnaces are on the first floor, the retorts on the second. The furnaces are fired with coke until the fire clay composing the retorts is at a white heat. The heating process is facilitated by gaseous fires in the open spaces surrounding the retorts. When the retorts are at proper heat the making of gas really begins by throwing coal into the retorts from both ends until they are completely filled. The doors are closed tightly then, and the terrific heat acting upon the coal produces the gas in its crude state. Every four hours the supply of coal in the retorts is replenished, the coke that has been formed being taken out. About 25 per cent of the coke is consumed again in the furnaces, and the remainder is run out on a chute and is put on the market for sale.

But this crude gas that is formed in the retorts is the interesting substance. It is impregnated strongly with tar and ammonia, all of which pass upward with the gas through what are termed "ascension pipes," large flues which run upward to the top of the bench, where they empty into a long, tightly covered trough known as the hydraulic main, where some of the ammonia and tar is deposited. This main is sealed with water, which serves the double purpose of preventing the gas from returning to the retorts when they are cold and to some extent cleansing the gas. From the hydraulic main the gas enters the "foul main," a pipe over 175 feet long and 20 inches in diameter. This pipe runs nearly the entire length of the immense building, and it requires an agile and sharp-eyed individual to follow it in all its course. Sometimes it is overhead, again it is under the floor, and further on it is climbing down the fire escape on the outside, but at last, after traveling a distance of 175 feet, it enters the "exhauster," a box-like machine in appearance, which draws the gas from the retorts, through the purifying process and into the holder. The "holder" is the technical term for that structure so familiar to every one who has seen a gas plant from the outside, that looks like a water tank with a roller coaster on top. After passing through the exhauster the tar and ammonia are separated from the compound substance in a machine known as the "scrubber," which is an iron cube-shaped machine with a capacity of 1,000,000 feet. Inside are brush and stones to which much of the tar and ammonia adhere. The gas passes thence into the condenser, which is another immense cube divided into six sections. Through each section run sixty 4 inch tubes, which are surrounded by cold water. The gas passing through this cold water is condensed. The tar leaves it at this point. But as a further precaution against tar deposits in the ammoniacal liquor there is a "tar breaker," a square iron machine fitted with screws, which breaks the volume of gas into small pieces and removes the tar.

The gas passes on to the standard washer scrubber, which is 7 feet in diameter and 16 feet long, with a capacity for washing 1,000,000 feet of gas per day. Its duty is to wash the gas. It is fitted with a large shaft running through the center and passing through numerous disks, in which are small perforations. These disks are always moving, pushing the gas through a body of water so as to percolate through the perforations, and thus separating the ammonia entirely. Thereafter the gas is free from ammonia. Then the gas goes to the purifiers, to be purged of carbonic acid and sulphureted hydrogen. This process is conducted in large iron boxes, 18 feet by 22 feet by 3½ feet in dimensions, in which are placed two tiers of trays. On each tray is placed about 12 inches of slaked lime, and in passing through this lime the gas is cleansed of the elements which it was desired to remove. It requires a great deal of lime for this purpose, and all of it is worthless ever after, except as a fertilizer. The gas company is glad to get rid of it by giving it away, but those who have land to be fertilized do not know of its valuable properties, or else are unaware that it can be had for the taking.

From its lime bath, the gas has one more journey before it is ready for marketing. It must pass to the station meter to be measured. This meter is like a large barrel lying on its side. It is 14 feet long and 12 feet in diameter, with a capacity of 2,000,000 feet in 24 hours. After the measuring has been accomplished, the gas passes into the holders, where it is stored, to be turned into the street in desired quantities, through the street governors.

That is the gas that burns on the street corners, in the parlors, and in the cooking and heating stoves.

It has gone through many processes, involving machinery that covers an entire block of ground, but when it is finished it is a first-class article. It is too valuable to be turned out to the public without measurement, and in the company's office are numerous machines for recording the quality, quantity, and pressure of the output. The pressure register only needs to be glanced at to be read. There is also an automatic register which, with a pencil, outlines on a paper the pressure during the day and night, and these charts are carefully preserved, so that it is possible to ascertain exactly the pressure that was on at any moment 10 or 12 years ago. There is also a jet photometer, which is to test the candle power of the gas.

The Memphis Gas Light Company has two holders, the new one, built by the Stacey Manufacturing Company, of Cincinnati, having a capacity of 425,000 feet, and the other, a relief holder for use with the water gas system, having a capacity of 100,000 feet.

The water gas system, which will be retained in addition to the coal gas system, is supplied with two Springer cupolas, 10 feet by 40 feet, with the capacity of 350,000 feet per 24 hours. It will be used as auxiliary to the coal gas system.

The main building of the plant is 164 feet by 62 feet, and 35 feet high, fronting on Chickasaw Street. It is of brick, with iron truss and slate roof. The purifying house is an extension of this main building on Mill Street. A lime shed is now in course of construction adjoining the purifying house.

Gas men will recognize in the above the description of a thoroughly complete plant for the manufacture of gas. The Memphis Gas Light Company is confident of being able to please its customers. The appliances for the regulating of pressure are perfect, and the repiping of the streets makes it possible to give good service in all parts of the city. The mains on Poplar, Washington, Adams, Jefferson, Court, Madison, and other residence streets have all been replaced with larger mains, and it is now possible to extend the service into the suburbs, if it were desired, without detriment to the present service. The gas is of a superior quality. The *Appeal-Avalanche* uses it in the furnaces of its linotypes. It will improve gradually until the new machinery gets in perfect working order, and then it will be of a quality unsurpassed.

The Lacquer Tree.

The juice of the lacquer tree (*Rhus vernicifera*) is the natural varnish upon which depends the famous lacquer work of the Japanese. Specimens of the tree were brought from Japan 16 years ago and planted in the Botanical Garden from rankfort, where they have flourished and have yielded seeds from which thrifty young trees have sprung. This place now has thirty-four healthy trees, 30 feet high and 2 feet in circumference near the ground. To determine whether the juice is affected by its changed conditions, Prof. Rein has sent samples to Japanese artists for trial, and is having comparative analyses made by eminent chemists. If the reports are favorable, it is expected that the lacquer tree will be quite extensively planted in Germany, and that Europeans will be instructed in the art of lacquering wood by some skilled worker from Japan.

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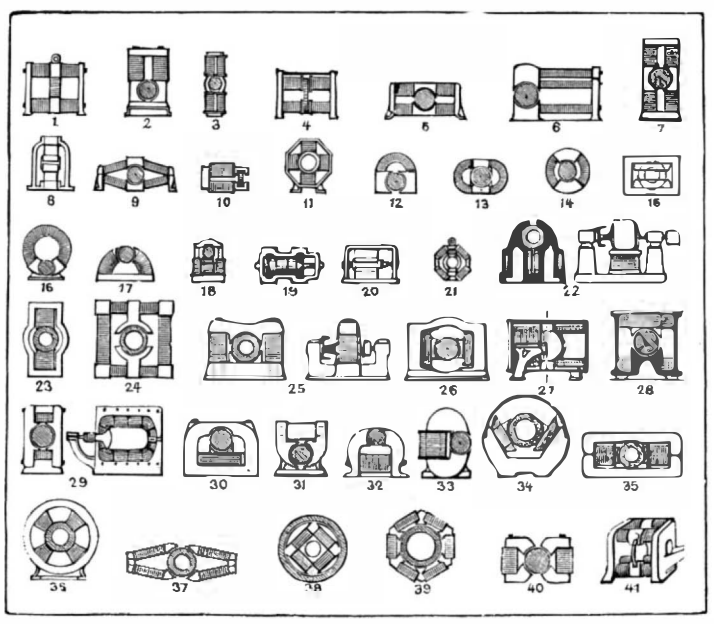
DYNAMO MACHINES.

If there are any apparatus that have particularly exercised the imagination of inventors, they are assuredly lamps, commutators, and dynamo machines. These latter, especially, have become very numerous in recent years. It is easy, however, to establish a classification between the different models. Every dynamo comprises two principal parts, viz., the armature and the inductor. The various kinds of continuous current armatures may all be referred to three well known types of winding—the Gramme, the Siemens, and the Edison. Besides these there are still other types that we must consider, and, in particular, the Desroziers winding. We shall not dwell upon the details nor upon the advantages and disadvantages of these various armatures, as they have already been presented to our readers.

As for the inductors, the same is not the case. It is but a few years ago that the labors of electricians indicated the conditions that these parts of the dynamo must satisfy. Among such conditions we may mention one in particular: it is necessary to reduce as much as possible the magnetic resistance of the current, or the resistance offered to the flux of force through the iron of the electros, and the air between the iron of the electros and the iron of the ring. The flux of force, as we know, is the product of the intensity of the magnetic field created by the surface embraced. Moreover, it must not be forgotten that a wire surrounding a piece of iron, and being itself traversed by a current, magnetizes such iron and creates in the interior a magnetic field of a certain intensity. If we take the product of such intensity by the surface of the piece of iron, we obtain the flux of force, the consideration of which is a most important matter in the construction of dynamos. These few remarks suffice to show that, in a good dynamo, the flux of force should have a maximum value. It is well, then, for a given number of windings of wire, to be careful as to the nature of the metal of the inductors, to employ iron of very great magnetic permeability, and to reduce as much as possible the resistance of the air necessarily interposed between the inductor poles and the armature. This latter condition imposes the obligation of placing the inductors as near as possible to the armature, leaving just the space necessary for the motion of the armature, and afterward of making the latter embrace the widest surface possible.

The second part of a dynamo machine, the inductor, gives rise, as may be seen, to more numerous inventions than the armature. In fact, there has been no want of models. One of our most learned electricians has conceived the happy and original idea of bringing together, in one plate, the various types of inductors of continuous current machines, which we reproduce in the accompanying engraving.

No. 1 represents the well known Gramme machine, No. 2 the Edison-Hopkinson, and No. 3 shows us the arrangement of the Siemens dynamo, with drum armature and horizontal inductors. This machine bears also the name of Hefner Alteneck, the engineer in chief of the Siemens establishment. In No. 4 we find the Schuckert type, with disk armature, and in No. 5 the form of the Weston machines with drum armature, of the Burgin ring machines, and of the Crompton, Paterson, and Cooper machines. No. 6 shows the large Edison machine of 1880, which was adopted by all the American central stations and by the Milan station. No. 7 represents a third type of the Edison dynamo of four or five bobbins. To this type is referred the English machine Phœnix. No. 8 gives the aspect of one of the first types of the Gramme machine. Messrs. Burgin & Crompton devised a dynamo, which is represented in No. 9, but which is now abandoned. In this we find the first principles of the Meritens and Jackson machines. Fig. 10 gives a diagram of the Kummer & Co. machine, which is similar to the Jones dynamo and the Gramme motor. In No. 11 is found represented one of the first models of the Gramme machine with several poles—a model which has since been constructed with more or less modification by the Oerlikon and Allgemeine Gesellschaft Companies, of Berlin. In all these machines we find a large external polygonal ring, to which, according to the radii, are adapted iron arms which, in the center, leave between them an annular space, in which the bobbin revolves. No. 12 shows a motor devised by Silvanus Thompson. No. 13 is a modification of the inductors of the dynamo No. 9, proposed by Mr. Kapp for the reduction of the magnetic resistance of the circuit. No. 14 is a section of the well known Griscom motor. No. 15 is a new form of motor for electric railways, constructed by the Thomson-Houston Co. In No. 16 is figured a section of the Eddy & Mather American machine. No. 17 shows a Furgersen dynamo. No. 18 shows one of the commonest forms of the Goolden and Trotter dynamos. The dynamo of the Telephone Company, of Zurich, is represented in No. 19, the Guzzi-Ravizza and Ironsides in No. 20, and the Tyne dynamo, of Scott & Moutain, in No. 21. No. 22 gives a section and profile of a superior type of Gramme dynamo, devised by Kapp, and since imitated by a number of manufacturers. No. 23 represents the Hochausen dynamo, No. 24 the Elwell Parker and Crompton dynamos, and No. 25 the Manchester type, due to Hopkinson. It is to this latter type that belong the Brown of Oerlikon, Mather & Platt, Sautter & Lemonnier, Tighe, Joel, Clark-Muirhead, Blakey, Emmot & Immisch, and Sprague machines. Nos. 26, 27, 28, 29, 30, and 31 show respectively the Lahmeyer, Thomson-Houston, Wenstrom, Eickmeyer, Continental, and Mordey & Jones machines. No. 32 represents a form common to several American motors, notably to the Patten and United States and Jenny motors. Silvanus Thompson devised the dynamo shown in No. 33, and Mr. Fein the dynamo shown in No. 34. No. 35 gives the form of Kennedy's iron-clad dynamo machine. Finally, the Alioth Helvetia, Elwell, Siemens (with interior poles), Thury, Kester, Brush or Schuckert-Mordey or Victoria dynamo machines are represented in Nos. 36, 37, 38, 39, 40, and 41. This enumeration comprises but a few of the principal types of continuous current machines, now no longer new. Doubtless, among all these dynamos, there are several that are superior to the rest, but still, the same qualities are sometimes reached by various means and different forms, and it is often difficult to fix one's choice between several models. The question of cost alone intervenes. The short history that precedes shows the path that the dynamo machine has traveled since its invention, and it proves that the mind of inventors has not remained inactive.—*La Nature.*



PRINCIPAL FORMS OF THE INDUCTORS OF DYNAMOS.

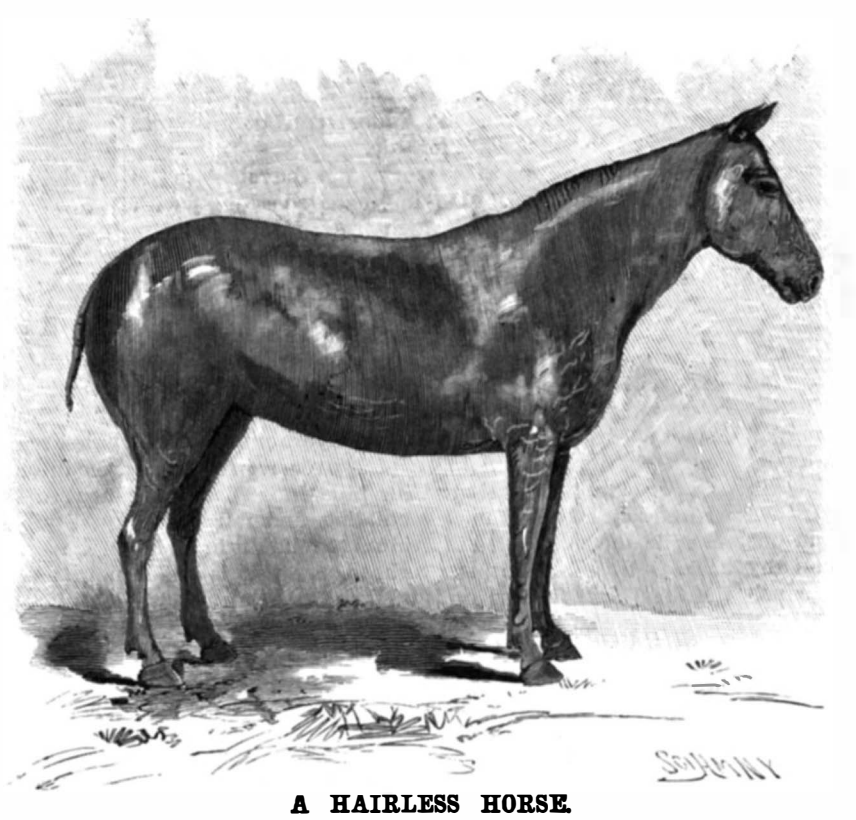
ALCOHOL is the mother of sorrow.—*Dr. B. W. Richardson.*

The Salt Industry of India.

The annual revenue derived from salt in the Indian empire is 7,000,000*l.*—$35,000,000—4*s.* per cwt. being the tax imposed. A large part of the salt consumed is imported, some of it is made from sea water, but most of the native manufactured article comes from the northwest provinces. In the Rajpootana district there is an important salt lake—the Sambhar—20 miles long by 5 miles broad, which yields from 100,000 to 120,000 tons of salt annually. This is a lake only in the rainy season, and it is before that—March to July—that the salt is fished out from the mud by natives. At this time the brine is of sp. gr. 1·08, and deposits the salt in crusts. It is not clearly known where the salt comes from, but the most likely theory is that the rain streams bring down with them saline matters into the lake valley, and, as there is no outlet, the salt in the course of time crystallizes out. Another source of salt is found in the brine pits of Gurgaon in the Delhi district. There the soil is highly charged with saline matters, and it is only necessary to dig holes in the ground in order to get a plentiful supply of strong brine. The trouble with this is that the brine contains magnesium sulphate as well as salt, and that rendered the salt bitter and unmarketable. Dr. Thomson was deputed by the government to find out a remedy for this, and he did, in the addition of 2 per cent of slaked lime, which converted the magnesium sulphate into hydroxide—thus providing a salt free from bitterness. Two per cent of lime was required; nothing less would do, although, strange to say, the whole of it did not enter into the reaction. The process was too expensive on a large scale. There is also a range of salt mountains further north (N.W. part of the Punjaub), where there are old mines now worked economically under government supervision, and yield 40,000 tons annually. It is calculated that there is enough salt here to last for 40,000 years. Dr. Thomson defended the salt tax on the ground that it is the only imperial tax which the poor pay, and it amounts to 5*d.* per head per annum. The tax has existed for 250 years.

THE HAIRLESS HORSE.

Some weeks ago we gave a description and illustration of a horse with phenomenal growth of the hair of the mane and tail, the rest of his coat being quite normal. In the present issue we give an example of the opposite extreme, from a life study of the curious animal portrayed. This is a horse absolutely destitute of hair. Neither neck nor tail nor any part of the body shows the least hirsute growth. The texture of the skin is silky and smooth; the color is almost a full black. The animal is of rather heavy type, and with his delicate surface does not produce any unpleasant impression. There are said to be two such horses known to exist in this country. One of them was foaled in the West; the one we illustrate is credited to Australia.



A HAIRLESS HORSE.

The skin in one of these animals is affected curiously, the perspiratory function seeming to be absent. The horse does not sweat when exercised, and the mouth or nose seems to provide the escape for what would otherwise be true skin perspiration.

Rich without Money.

Many a man is rich without money. Thousands of men with nothing in their pockets, and thousands without even a pocket, are rich. A man born with a good, sound constitution, a good stomach, a good heart and good limbs, a pretty good head piece, is rich. Good bones are better than gold, tough muscles than silver, and nerves that flash fire and carry energy to every function are better than houses and land. It is better than a landed estate to have the right kind of a father and mother. Good breeds and bad breeds exist among men as really as among herds and horses. Education may do much to check evil tendencies or to develop good ones, but it is a great thing to inherit the right proportion of faculties to start with. The man is rich who has a good disposition, who is naturally kind, patient, cheerful, hopeful, and who has a flavor of wit and fun in his composition. The hardest thing to get on with in this life is a man's own self. A cross, selfish fellow, a despondent and complaining fellow, a timid and care-burdened man, these are all born deformed on the inside. They do not limp, but their thoughts sometimes do.—*Source unknown.*

THE University of Oxford has the reputation of having been founded by King Alfred in 872. It numbers at present about 12,000 members.

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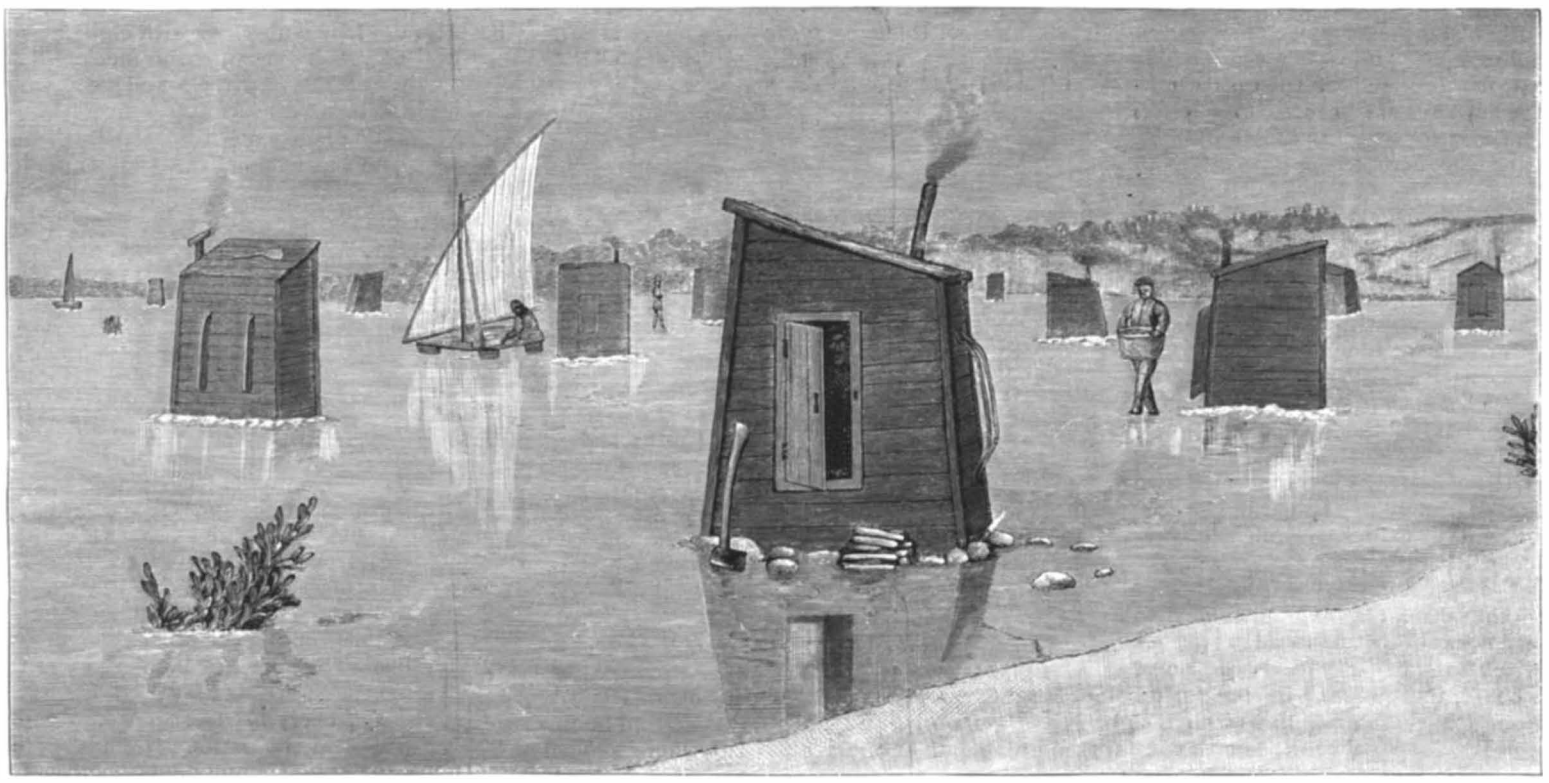
PIKE SPEARING ON HAMILTON BAY.

Pike spearing is a recognized industry on the shores of Hamilton Bay, Lake Ontario, the harbor of the beautiful city of Hamilton, during the winter season. The first intimation the citizens have that the ice is formed thick enough to bear is when they see some fine morning the little square huts of the adventurous spearsmen shoved out on the glistening surface of the frozen waters. The huts in which the spearsmen shelter themselves from the cold are small wooden structures about five feet square by six feet high, with a small door on the side, and sometimes a window. They are easily fitted on sleds, so that their owners can draw them over the ice from place to place in search of an advantageous location. When the spearsman has deported his hut to the proper point, he proceeds to cut a hole in the ice about eighteen inches in diameter, and over this he sets the hut, having taken it off the sled. The outer edges are banked up with snow, and water poured over it until it freezes solid, and the cold is effectually excluded. The interior furniture is very simple, and usually consists of a piece of board nailed across one corner for a seat, and another shelf on which stands a small cast iron stove, the pipe of which goes through the roof. A village of these miniature houses makes quite a picturesque appearance on a bright winter morning. The spears, hand nets, poles, etc., piled against the sides, the little heaps of fire wood beside each door, the spiral wreaths of delicate blue smoke ascending almost perpendicularly up into the clear, crisp, frosty air, and the long shadows cast by the rising sun along the shining surface of the snow-covered lake make up a picture against the background of somber evergreen-covered bluffs that is not easily forgotten.

The spearsmen usually select portions of the bay where the water shoals and has a smooth, sandy bottom. They do not, as a rule, venture into deep water, but prefer the shallow eddies where the bottom is plainly visible. The hut is kept carefully closed, and the only light to the interior comes up through the ice beneath. It needs great patience as well as endurance to make a successful spearsman. There he sits hour after hour on his little ledge with his six-pronged spear poised above the hole in the ice, watching for the curious pike coming up to investigate the shining minnow bait at the entrance of the hole or to get a breath of air. When sport is good the occupation is fascinating enough as a pastime, but it often happens that the spearsman may sit in the bitter cold for an hour at a time, not daring to move, and yet never see the slim, graceful outlines of a fish in the translucent waters below. When a pike does appear, the spearsman waits until it is well under the hole, and then, before it has time to be alarmed, darts down his six-pronged spear like a flash. The spear resembles lightning, according to the small boy's definition, in that it never needs to strike twice in the same place. It is seldom the fish can dodge it.

Sometimes the houses are larger and more pretentious than those above described, and the spearsman is occasionally accompanied by a boy to feed the stove, bring in wood and generally look after his comfort. But at the best it is rather a lonely and arduous way of making a living. Hamilton Bay is particularly well adapted to this mode of fishing, as when the ice is once formed it seldom breaks up until the winter is over, on account of the inclosed nature of that body of water. Frequently as many as two or three hundred of these huts can be counted on the surface of the bay and among the many coves that mark its beautiful shores. The illustrations this week by Mr. Heming provide an excellent idea of the appearance and habits of this intesesting class of fish hunters.—*Dominion Illustrated.*



FISHING HUTS, HAMILTON BAY, ONTARIO.

PIKE SPEARING ON HAMILTON BAY, ONTARIO.

Vaseline.

Mr. Robert A. Chesebrough, of New York, is the inventor of vaseline. When in London recently he was interviewed by a representative of *The Chemist and Druggist*, and among other things gave the following particulars:

"The reason why vaseline is scarce is that we have not got the article. With our present plant—which is a pretty large one, as you may judge when I tell you it cost us half a million dollars—we can't produce fast enough to meet the demand. Every pound of vaseline we sell has to be collected drop by drop as we filter it through bone black. That, too, has given us some trouble. We use some sixteen tons of bone black every day, and the sugar combination in America has got hold of the manufacture of that article and has put some difficulties in our way. But I think we have conquered that obstacle. The principal cause of our limitation of supply, however, has been the remarkable expansion of the demand which we have experienced this year. In America, in England, and particularly on the Continent, there seems to have sprung up a sudden unanimity in favor of our product. The scientists in Germany, who have been backing the cheap mixtures of earth wax and oil which have been sold as paraffinum molle there, seem to have found out their inferiority, and have withdrawn their recommendations. Our trade with Germany has largely and almost suddenly developed.

"Vaseline is not a distillate nor a mixture of so-called paraffins, but a gelatinous residual substance. It is *sui generis*. We cannot make it by mixing paraffin wax and petroleum oil together, nor can paraffin be made from it without distillation.

"A very important structural change takes place in the process of manufacture, for vaseline is purely amorphous, and no paraffin crystals can be separated from it by pressure after freezing."

The oftener vaseline is filtered, the higher becomes its melting point. That is why the white vaseline is stiffer than the yellow. The latter, as now turned out, melts at 97° F., but beyond this point the company do not propose to go, in fact, they cannot go as it is at present manufactured, but it is possible that they will hereafter introduce a much harder jelly, which dispensers can use to add to ordinary vaseline when necessary. This harder jelly is made from a thick deposit which separates from natural petroleum.

Mr. Chesebrough said it was about 1869 or 1870 that he first produced vaseline. He was in the petroleum trade then as a refiner, and was fond of experimenting. When he produced vaseline he was convinced of its pharmaceutical value, and patented the process of manufacture, but from then till 1876 he got very little encouragement. The doctors and the chemists were very slow to take to it, and only did so after the public were appealed to.

"It nearly broke me," interjected the colonel, with a gallant effort to resume his sadness of fifteen years ago. During these years Mr. Chesebrough said he spent every dollar he received in advertising the new product and introducing it to the profession. Altogether over a half a million of dollars had been spent in introducing it, besides another half million in plant. About 1876 it began to go. By 1880 it was a great business and was made into a joint stock company, and about that date the Standard Oil Company acquired a controlling influence in its management—Mr. Robert A. Chesebrough retaining, however, the presidency of the company. About 250 men and 130 girls are employed at the company's works in Brooklyn, and the offices in State Street, New York, are among the finest in the city.

A Giant Bowlder.

One of the biggest rocks ever moved in the course of railroad construction in this country was recently excavated on the line of the Mexican Southern by Col. Lamar. The *Lower Californian* says the giant bowlder was 120 feet in height and measured 1,000 cubic meters. Six dynamite cartridges were placed under the rock, after the men had excavated as much earth as possible, and were fired one after another. At the sixth explosion the big fellow rolled out of the way.

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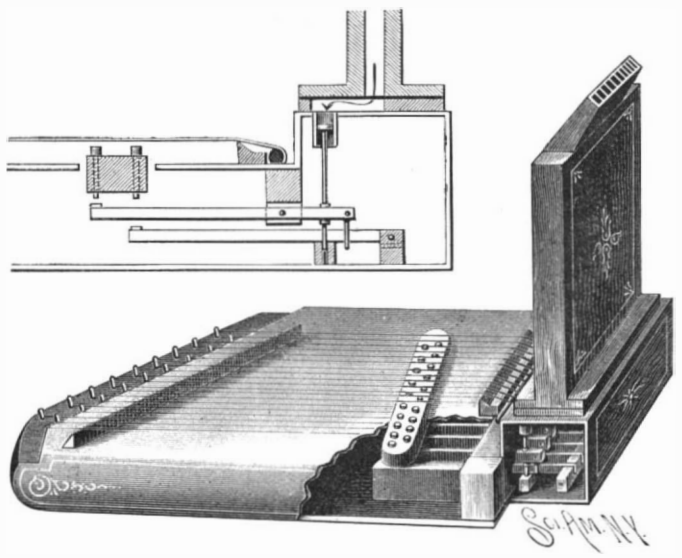
A NOVEL MUSICAL INSTRUMENT.

An instrument upon which any harmonica player can perform, but in which the tones are produced by strings struck and vibrated by hammers, instead of reeds operated by air pressure, is shown in the illustration, in section and in perspective. The playing portion is arranged similarly to a harmonica, and by the inhalation and exhalation of air through the air tubes the hammers are arranged to strike the strings in a manner similar to the hammers of a piano. This improvement has been patented by Mr. Edwin P. Hicks, of McAlester, Indian Territory. The strings pass over bridge pieces of the sounding board, and have their ends wound about the usual tuning pins, while a detachable upright, having at its upper end a mouth piece similar to that of a harmonica, is secured to the base of the frame, a felt strip being interposed between the upright and the base to form an air-tight joint.

The mouth piece has key or air openings which extend down through the upright and communicate with air chambers in the base, as shown by the arrow in the sectional view, these chambers communicating with air cylinders, one for each pair of keys or hammers.

These keys consist of levers arranged alternately, an upper set being fulcrumed upon a rod supported by end blocks, while the lower levers are fulcrumed at their rear ends in a transverse bar, the operating rods, connected with the upper set of levers, having at their upper ends pistons operating in the cylinders, while the lower levers are connected with the rear ends of the upper ones by Z-shaped wires. The front ends of both levers are tipped with felt, and arranged to strike plungers loosely held for vertical movement in a plunger block fitting in a cut-out portion of the sounding board, the plungers having their hammer heads normally about a sixteenth of an inch below the strings. By blowing into the mouth piece the pistons of the different cylinders are depressed, thereby operating one series of keys to throw the plungers up against the strings, the elasticity of the strings quickly throwing the plungers back to their normal position, whereby the strings are allowed to vibrate after being struck. By drawing in the breath, and sucking up the air in the chambers, the pistons are drawn up, raising the rear ends of the upper series of keys, and causing the adjacent connected lower levers to strike the plungers, throwing them in a similar manner up against the strings. The invention provides a combined harmonica and zither or harp-like instrument designed to be of simple construction and comparatively inexpensive.

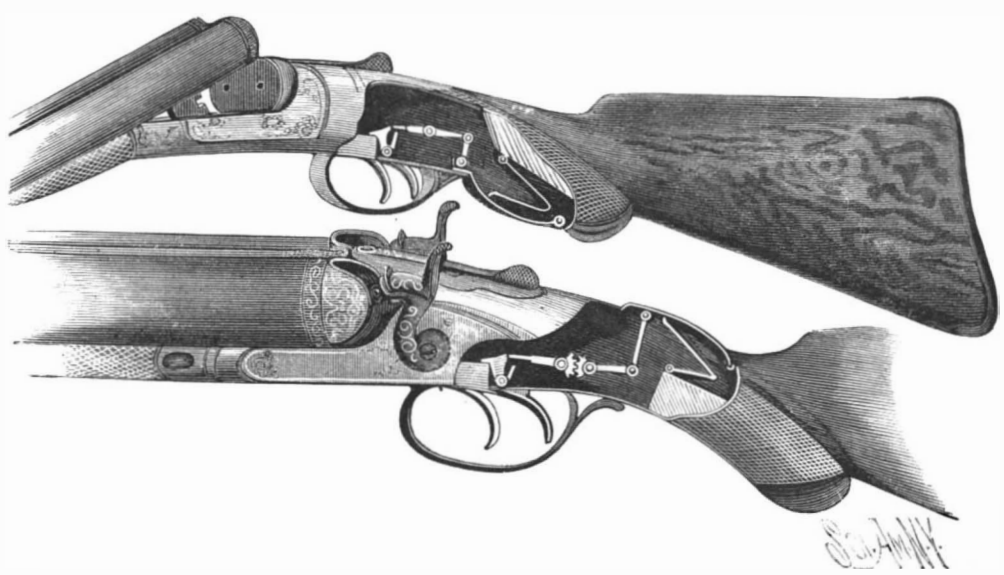


HICKS' PNEUMATIC ZITHER.

AN IMPROVED SAFETY CATCH FOR GUNS.

The illustration represents a simple and durable device, which can be attached to the lock of any gun, whereby the triggers will be normally locked, but when the arm is held at the shoulder, or in a firing position, the pressure of the hand upon the grip or stock of the piece will instantly release the triggers. This improvement has been patented by Mr. William E. Jenkins, of Rock Hill, S. C. As shown applied to a hammer gun, in the lower view, a lock latch is pivoted in a chamber in the stock in such manner that the head of the latch is normally held in engagement with the body section of the trigger by a pivoted spring-controlled lever. There are two of these levers, independently pivoted, with their facing ends in segmental form and provided with teeth held in mesh with each other, the forward end of one lever bearing firmly against the latch, which is thus held in locking engagement with the triggers. The rear end of the other lever is pivotally connected by a link with the under face of a trip plate, pivoted in the top of an opening in the stock chamber, a spring normally holding this plate up to close the opening. The outer face of the trip plate extends just beyond the outer surface of the grip section of the stock, and by pressing the plate inward against the tension of the spring the outer end of the rear lever is depressed, turning down at the same time the forward end of the other lever, which enters a diagonal recess in the back of the latch, which is thus forced rearward and downward and completely disengaged from the triggers. The moment pressure is removed from the trip plate the spring returns the plate to closed position and the levers to their normal or locking positions. In the application of the improvement to a hammerless gun, as shown in the top view, the trip plate covers an opening in the bottom of the stock, and a single centrally pivoted lever is employed instead of the dual levers, both forms of the device being equally efficient for the purpose designed, and being adapted to afford immunity from the large number of accidents constantly occurring from the accidental or careless discharge of guns.

Further information relative to this invention may be obtained of the Jenkins Safety Catch Gun Co., Rock Hill, S. C.



THE JENKINS SAFETY CATCH FOR HAMMER AND HAMMERLESS GUNS.

The Berlin Elevated Railroad.

This belongs to and is run by the government, as are most of the railways in Germany. It carried between five and six million passengers last year, and pays well on the investment. At certain hours of the morning and evening, when it is more availed of by the laboring classes, rates of fare are very low; at other times rather higher than on the New York elevated railways. This railway, which belts the entire city, must be seen to be appreciated by those familiar with the New York elevated system and its disfigurement of the streets. The Berlin street railway is constructed with as much care and solidity as are any of the great trunk railways of the United States. Its passenger stations are more commodious and give better protection to passengers than the majority of railway stations in the principal cities of America. Instead of disfiguring the streets, it is an ornament to them. When it runs on a level with the upper stories of a house, passengers have no chance to look into the windows of sleeping rooms, for it is so managed that the tracks pass by the side walls where there are no windows. After the route had been surveyed and determined upon, the government bought every piece of property that could be in the least degree damaged. The houses were torn down so as to give clear space; the whole bed of the sidewalk, and in some instances of the street, was occupied. In order not to interfere with business, wherever necessary new outlets were opened where old ones were closed. A solid superstructure of masonry, with exterior walls presenting as finished an appearance as that of well-built houses, and ornamented at the top with arches and railings, was constructed. On this was laid the tracks, laid as I have said with as much care and of as durable material as will be found anywhere. Going though the most populous districts, it, neither by smoke, sound, nor appearance, causes annoyance of any character. For miles, ensconced under the massive roadway, are to be found restaurants and shops, where people eat, drink, sell, and buy without the least consciousness of the rumble and the roar above their heads.

Sugar in Florida.

The only sugar mill in Florida is situated eight miles from Kissemmee, at a place called St. Cloud. It is situated on a beautiful lake in latitude 28°, and is in what is known as the Disston purchase. The lake has been drained so as to be lowered about ten feet, and the mill and plantation is situated in what was once a swamp. The place has about one thousand acres of muck land, on which the cane grows. It is by far the prettiest place I saw in Florida, and is said to be extremely healthy. There is about five miles of narrow gauge railroad laid down permanently, and several miles of iron railroad in sections that are movable. They also use four mule carts with eight inch tread, so that they won't cut into the muck. The muck or soil is the decayed roots and trash of the bottom of the lake, in some places five feet deep, at others only a few inches. Under all is white land. Pine land is from one to two miles apart; between it is the plantation. The muck land yields from twenty to forty tons of cane to the acre, averaging about thirty. The cane tassels in some spots, but not all over. The company pays $4.50 per ton for cane and makes it produce 189 pounds of sugar. Profits are large.

They now have about seventy stations and twenty-five laborers; but in grinding season have double that number. They prefer negroes. They work thirty-five mules, buy all their feed except a very little. The company has its own store and its own railroad. The canal is about forty feet wide and the water very swift through it down to the next lake; also have a draining machine to throw out the rain water. This year they are planting 600 acres more in cane, and say it will ratoon in five years, which I doubt. The muck or soil gets on fire sometimes and burns up the stubble. The tops are hauled out, as they are afraid to set them on fire, as they do in Louisiana. The land is ditched every 100 feet in wet weather. They put bog shoes on the mules. Italians are not very good laborers; the company prefer negroes. Wages are $1 per day, and the laborers feed themselves. They say Italians are so economical that they will not furnish themselves good food. I expect it is so, as they move very slowly and appear to be very stupid.

There is one manager and two overseers on the place, besides a blacksmith and cooper, etc. The mules are a good size, but are not fat. I saw no oxen or hogs. The cane rows are eight feet apart and cane is very thick. They do not dig the stubble. The cultivation is very easy. As there is no grass scarcely, the company has sold no small tracts of land yet. They are preparing to plant several thousand acres in rice. Take it all in all, it is a splendid place and will be extremely profitable if the soil or muck proves to be durable; they use no fertilizers yet. The piney woods of Florida are agriculturally worthless.—*Home and Farmer.*

A New Solvent of Camphor.

From the frequency with which the indications for the subcutaneous injections are met with, it is evident that a good and reliable solvent for this substance is a great desideratum. Ethereal solutions rapidly evaporate. Alcoholic solutions also evaporate, and the camphor becomes precipitated, so that injections of such solutions produce severe pain or even abscess. Solutions of camphor in oil are difficult to employ, while besides possessing the disadvantage of the liability of becoming rancid.

In the *Zeitschrift fur Therapie* for September 1, 1891, Dr. Karl Rosner recommends in the highest terms a solution of camphor in liquid paraffine, which, when slightly warmed, forms a perfectly clear and limpid solution. He states that he has kept this solution for more than five years without its properties becoming changed.

A Digest of Cycles.

In the United States Patent Office classification of inventions cycles are to be found under such sub-classes as velocipedes, tires, wheels, hand cars, traction wheels, sled propellers, sled brakes, wheelbarrows, signals, lamps, cyclometers, etc. Mr. J. H. Allen, an examiner in the Patent Office, has compiled a digest of these, including many other sub-classes, such as attachments, mode of propulsion, etc.

The drawings and claims will be given. The publication is to be in two volumes, viz., plates, claims; containing from 1,000 to 1,500 pages. Subscription price, $50. To inventors, manufacturers, and attorneys the digest will be found invaluable for making preliminary as well as expert examinations, and will save many times its cost.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING—Willis Dodge, Blaine, Me. This is a simple device designed to be easily applied to a common form of coupler, to permit cars to be automatically coupled without the brakeman stepping between them. Within the drawhead is a spring-pressed plate having a projecting forward end and a recess to receive a pin, while a swinging lifter is pivoted to extend in front of the drawhead, there being also mounted on the drawhead a sliding bar carrying a lever mechanism adapted to operate the lifter.

CAR COUPLING. — Alfred R. Heath, Covington, Ind. This invention covers an improvement on former patented inventions of the same inventor, to provide increased strength and greater convenience in effecting the coupling and uncoupling. The improvement embraces a coupling hook pivoted to a fixed drawhead, with a pivot pin having a forward and backward play, a yoke secured to the pin and a draw-spring connected with the yoke. The invention includes an improved means for simultaneously actuating from one car the coupling hooks of both cars in uncoupling devices, by which cars provided with this improved coupler are adapted to automatically couple to cars having the ordinary link and pin coupling.

METALLIC TIE. — Francis H. Hicks, Little Rock, Ark. This tie is adapted to securely hold the rails in place without the use of the ordinary spikes or bolts, while it is designed to be simple and durable in construction, cheaply manufactured, and laid down without the help of skilled labor. It has two angular parts forming interlocking top flanges, integral with which are lugs to engage the base of the rail at opposite sides of the web, while there are tongues in each of the top flanges opposite at the side of the corresponding lug, bolts holding the angular parts in an interlocked position.

RAILWAY CROSSING SIGNAL.—William J. Butler, Woodstock, Canada. An alarm to be sounded by a train passing the crossing is provided by this invention, the alarm being sounded whether the train moves slowly or rapidly. A lever is placed in position to be engaged by the wheels of a passing train, and this lever is connected by intermediate mechanism with a spring-actuated trip lever, and a pivoted and spring-actuated striking lever, held in suitable position in relation to a gong or bell, the alarm being sounded by each wheel as it passes over the main lever.

Mining, Etc.

GRINDING AND AMALGAMATING MILL.—George Fraser, Auckland, New Zealand. This is a mill for reducing gold, silver, tin, or other mineral ores and hard substances. It is of simple and durable construction, and designed to be very effective and continuous in operation, separating the precious metal from the tailings at a low cost, and making it possible to work low-grade ores. It has a fixed casing with an annular grinding surface, a revolving frame in the casing loosely supporting a series of grinding rollers in contact with each other, the rollers being revolved upon the frame in contact with each other and with the grinding surface of the casing. The machine dispenses with the use of gratings or screens, copper plate tables, riffles, blanks and berdans, and reduces the loss of quicksilver to a minimum.

CHAIR FOR MINING CAGES.—Alexander Gray, Butte City, Montana. Wall plates are, according to this invention, arranged in the path of the cage, on the bottom of which sliding chairs are mounted adapted to engage the plates, the chairs being arranged near opposite sides of the cage and connected by spring-pressed levers, there being a lever mechanism for moving the chairs against the spring-pressed levers. The device is designed to be operated from the cage or by a station tender, and permits the cage to be stopped at a desired point without jar or injury, the device when not in use being entirely out of the way, so that the cage cannot be accidentally stopped.

Mechanical Appliances.

BRICK AND TILE CUTTING MACHINE.—John W. and George H. Aregood, Washington, D. C. This is an improvement in that class of machines by which the clay is formed into long slabs fed along a carrier, then cut into proper lengths and fed off the carrier. The carrier belts are driven independently of the movement of the clay and are separated at their ends, cutting wires being arranged to descend between the adjacent ends of the belts, the wires cutting down through the slabs of clay to form the proper lengths, which are discharged off the carriers before the wire ascends, preventing the making of ragged ends on bricks, as so often occurs when the wires are moved upward through the cuts made by them in the clay.

LEATHER FINISHING MACHINE.—Elihu C. Northrop, Bodines, Pa. In this machine a firmly and strongly supported bed on which the leather is laid and handled by the operator is adapted to be raised by pressing on a treadle, to receive a partly slipping or sliding and partly rolling action of a roller held in the frame above, the rolling wheel being firmly held against upward pressure, and having only a partial revolution each way as it makes a backward and forward motion on the working of a pitman. All the parts are solidly supported to give the required pressure on the leather to effect a thorough burnishing and finishing of it.

Miscellaneous.

CASTING FOR ROPE HALTERS.—George C. Edwards and Burnett V. Buffington, Marysville, Ohio. This is a casting piece to which a single piece of rope is attached to produce the throat latch and nose strap, the free end of the rope forming the hitching strap. The casting has a main body portion with apertures near its forward and rear ends, while outwardly projecting arms at each end also have apertures, forming a cheap and simple device, so made as not to annoy the animal. Instead of being cast, the device may be made of wrought metal if desired, or struck up from thick sheet metal.

TONGUE SUPPORT. — David Z. Yoder, Sterling, Ohio. This improvement is more especially designed for application to self-binders, reapers, mowers, corn planters, etc., where great weight is thrown on the horse's neck when the driver dismounts, although adapted for other uses. It is a U-shaped support, pivoted to the tongue, its members of unequal length, and the longer member projecting above the tongue and connected by a rod with the driver's seat, whereby the support may be conveniently swung up or down and locked in either position.

WEATHER STRIP.—Sidney R. Deacon, Electric, Cal. The strip proper is sector shaped in cross section and adapted to be hinged in a correspondingly shaped recess in the bottom of a door, where it is held by a spring, a beveled plate being recessed to the door jamb, against which a projection on the weather strip acts to force the strip from its recess. It is an inexpensive device, to be automatically closed to the door sill as the door closes, and rise and be invisible within the door as it is opened.

FIRE EXTINGUISHER. — Lafayette D. Fuller, Muscogee, Indian Ter. This is a wheeled tank, to be supplied with a fire-extinguishing fluid, the liquid flowing from the tank into barrels in which plungers are operated by a lever, whereby the fluid is propelled through a discharge nozzle in the desired direction. One plunger is always on the down stroke, whereby a continuous stream of fire-extinguishing fluid is forced through the nozzle, and the whole apparatus is very simple in construction, requiring but little force to throw a stream a considerable distance.

ANIMAL TRAP. — Judson A. Haney and Frank J. O'Connell, Coal Grove, Ohio. This device has a stationary base divided into a series of stalls, with a spring-controlled cover connected with a bait hook, with which also is connected a trip bolt, there being adjustable stop rods in the stalls adapted for engagement with the bolt. The animal entering is imprisoned, and the trap is automatically set again, and means are provided whereby an additional receptacle may be connected with the stalls, for the reception of an increased number of imprisoned animals.

GAME APPARATUS.—Frederick A. E. Van Guericke, Djokjokarta, Java. This is an apparatus to be used in lotteries and games of chance, comprising a series of balls having distinguishing characteristics, a board having a spiral and indexed groove, and a rotating drum with apertures through which the balls pass to be delivered to the groove of the board. The rotating drum is placed within a vertical cylindrical casing, and vanes, buckets, or radial projections insure the thorough mixing up of the balls, which are inserted through a funnel in the lid.

LAMP SHADE. — William J. Boesen, Orange, N. J. This shade is constructed of separate and independent graduated overlapping ring-like sections of fabric, the sections being transversely creased to produce alternately arranged ribs and depressions, lacings uniting the sections and forming pivotal points therefor, while a gathering string is carried by one of the sections. The shade is of simple construction and designed to automatically conform to the contour of any shaped frame on which it may be placed.

CAN OPENER.—John P. Smith, Philadelphia, Pa. This is a hand tool or cutter in which two knives are used, in an adjustable knife carrier adapting the device to different sized cans. One of the knives is curved and the other straight on the cutting edge, and there is a pivot pin on the under side of the inner end of the tool, which pierces the top of the can at the center. When the handle is pressed down the curved knife penetrates the top of the can and the straight-edged blade rests firmly down upon it, the opener or the can being turned or rotated, and the cut being made perfectly smooth.

VEGETABLE CUTTER. — James S. Patten, Baltimore, Md. This is an improvement in cutters or slicers in which the vegetable or fruit is carried by a reciprocating holder, operated by a crank and arranged to work on a bed or table provided with a cutter. The fruit holder consists of a box, open at the top and bottom, in which a spring-actuated follower works vertically to press the vegetables or fruit down upon the bed to which the cutter is secured, the follower being made to bear with the desired pressure. The knife bed may be taken out and a grater put in when desired.

MIXER OR BEATER. — Arobine C. Mitchell, Enniss, Montana. This is a simple machine, more especially for use on the materials or batter of which cake, etc., are made. It has a basin or bowl in which the batter is placed to be beaten by a curved, apertured, plate-like paddle, operated by a rotating crank with which is connected a speeding gear, whereby all the batter will be evenly beaten without any special scraping down. The machine may be fastened to a shelf or table or held in the lap of a sitting operator, one hand then holding a handle of the frame while the other turns the crank.

BROILING DEVICE.—Mary A. Burriss, New York City. This device has a base section in skeleton form, preferably made of sheet iron, and a hinged cover section, the base section, in operation, being placed to cover and surround the top of the fire pot opening of a stove or range, when the meat to be broiled is clamped in a broiler centrally supported. By use of this device meat or other articles may be broiled without the escape of smoke or odors into the room, and the fire will not be cooled, as its surface is not exposed to the air.

SASH RAIL FASTENER. — Edwin A. Pumyea, Jersey City, N. J. This device is designed to automatically lock the upper and lower sash together at their meeting rails and retain them in a locked condition until released by a proper manipulation from the interior. Combined with a keeper plate having a projecting tongue is a sliding bolt within the casing and spring therefor, a rocking trip plate detachably engaging notches on the bolt, there being also on the bolt a spring-actuated locking dog to engage the casing when the bolt is in locked adjustment. The device is designed to be very inexpensive and easy to manipulate, while affording positive security against tampering with the mechanism from the exterior of the window.

FENCE WIRE REEL.—Sylvester Moore, Audubon, Iowa. A vehicle body supports the frame of the device, in which two reel shafts are independently mounted, each having a sprocket wheel, while a drive shaft mounted in the frame has sprocket wheels connected by chain belts with the wheels on the reels. The arrangement is such that the wire may be wound upon the reels or unwound therefrom as the vehicle is drawn forward, thus enabling lines of fence wire to be laid or removed without the operator handling the wire or leaving the vehicle, while the necessity of lifting heavy reels to and from a wagon is avoided.

BED AND TRUNK.—George W. Snaman, Jr., Allegheny, Pa. This is a combination device specially adapted for tourists' and camp use, providing in compact form a comfortable bed and a receptacle for clothing or other articles. The trunk body has one open end and has a hinged hollow lid, in combination with a sliding couch tray having one end open and an end wall adapted to close the open end of the trunk body when the tray is fully inserted. In use as a bed, the couch portion is drawn out and the feet and limbs are accommodated in the portion embraced in the trunk body.

BATH TUB ATTACHMENT.—Matthias H. Welles, Elmira, N. Y. This improvement consists of a removable body-rubbing attachment, with a flexible face-covering detachably secured to it. A covering or facing piece is stretched across and secured to marginal supports in such manner that when the back of the bather rests against it a slightly concave and yielding support will be formed for the back, such support forming a good friction or rubbing surface for the body when the feet are pressed against the lower end of the tub or against a foot rest.

ANNUNCIATOR.—William C. Dillman, Brooklyn, N. Y. This invention provides a device which will automatically make and break a circuit in which an electric bell is included, so that the circuit will be closed but a short time and the bell rung only long enough to attract attention. Connected with a speaking tube and the bell is a drop leaf arranged at the mouth of the tube and forming one terminal of the bell circuit, a yielding contact adjacent to the drop leaf forming the other terminal, while a projection on the leaf is adapted to strike and pass the yielding contact when the leaf is dropped.

STOPPER. — Francis S. Hume, New York City. This invention provides a rubber stopper having a textile core, and adapted for stopping bottles and other vessels containing acids and other liquids. The central portion of the stopper is composed mainly of textile material, so that the stopper will not be injured by corkscrews and will be more durable than stoppers made wholly of rubber, the invention also providing a mould for forming and capping the stoppers and for containing them during the process of vulcanizing.

GATE LATCH.—Gabriel Rohrbach, Del Rio, Texas. This is a simple device consisting of a spring-pressed rocking arm adapted to engage a slide bolt, the arm having an outwardly inclined upper end engaged by the toe of a spring-pressed sliding bar, forming a catch which may be adjusted toward or from a gate on a post to be engaged by the latch, and enable compensation to be made for spreading of the posts.

KNOCKDOWN BARREL. — Robert W. Baylor, Norfolk, Va. This invention relates to barrels in which the slats or staves are straight and connected to flexible bands or hoops which may be rolled up in cylindrical form for barrels or laid out flat for return shipment. The slats or staves are held and properly spaced on the hoops by undercut grooves, and provision is made for a middle partition, constituting a two-part barrel. This barrel or crate is adapted for shipping all kinds of fruit and vegetables, being especially suitable for oranges.

NEWSPAPER FILE. — John J. Shenk, Burkittsville, Md. This file is formed with bars, one of which has pins projecting into slots in the other bar, while a curved spring plate attached to the end of one bar is hinged to the other bar, the hinge pivot allowing the other bar to be swung laterally to one side as well as vertically, to facilitate putting on and taking off papers. At their opposite ends the bars are held together by a spring attached to one bar and adapted to be reading engaged with the end of the other bar.

BOW FOR VIOLINS, ETC.—William H. Ayres and Henry Schroeder, Whipple Barracks, Arizona Ter. According to this invention, the frog has a recess adapted to receive the ends of the hair, and a wedge-shaped block fitting in the recess is adapted to press and lock the hair in place on one of the walls of the recess, a cover being fitted to slide on the under side of the frog. The device is simple and durable in construction, and permits of readily and securely fastening the hair in bows for violins, violas, violoncellos, bass viols, etc.

AIR SPINNING TOP. — Leo Leeb, Alingsaas, Sweden. This is a simple device by means of which one may propel a wheel to a considerable height in the air, the wheel revolving in opposite directions going up and coming down. The wheel is preferably made of sheet metal, with a heavy rim and propeller blades set at an angle, while centrally it is formed for ready engagement with and detachment from a shaft to be revolved in a handle, by the operator pulling on a string, whereby the wheel is rotated at a high velocity, and ascends rapidly on its release, by the action of the propeller blades on the air.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

AGE OF THE DOMESTIC ANIMALS. By R. S. Huidekoper, M.D. Philadelphia: F. A. Davis. 1891. Pp. 225. Price $1.75.

This work cannot fail to be of interest to all who own or are interested in dogs and horses. The author is well known as a student and teacher, as well as a practitioner, of veterinary medicine, and he has been led to make the subject of the dentition of the horse, ox, sheep, hog, and dog a special study. The various means of determining the age of the domestic animals, other than by the dentition, are given. Over 200 illustrations of the teeth and jaws at different periods of growth add value to the book. There are perhaps few men as thoroughly qualified as Dr. Huidekoper to write upon the subject.

A BOOKSELLER'S LIBRARY. By A. Growell. New York: Office of the *Publishers' Weekly*. 1891. Pp. 77. Cloth. Price $1.

This little volume is intended to serve as a guide for the bookseller. The volume contains an annotated list of American and foreign trade catalogues and journals, with hints for their use. The bookseller will find in this little volume hints useful in the conducting of his business.

THE TOURIST'S CABLE CODE, published by Brentano, New York, is the title of a handsomely arranged little book treating of a new and extremely simple system for sending telegraphic messages. The new system permits of sending a series of sentences by the use of but a few words, the key to which is instantly and unerringly found by the receiver, so that mistakes are next to impossible. The book contains full instructions for using the system and, by means of dummy messages, readily and quickly initiates the beginner. The system is adaptable for any private or special business, although the book itself contains tables and keys for the general use of tourists and merchants. Blank tables are provided for readily making up a private secret code under the same system.

SCIENTIFIC AMERICAN BUILDING EDITION.

JANUARY NUMBER.—(No. 75.)

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1. Elegant plate in colors of a picturesque residence in the American Renaissance style of architecture, erected for Gen. T. L. Watson, at Black Rock, Conn. Two perspective and an interior view, with floor plans, etc. Henry A. Lambert, architect, Bridgeport, Conn.
2. Plate in colors of a colonial house erected at Portland, Maine. Perspective elevation and floor plans. Cost $3,800 complete.
3. A very attractive residence at Sea Side Park, Bridgeport, Conn. An admirable design. Floor plans and perspective elevation. Cost $18,000 complete.
4. A cottage at Richmond, Mo., erected at a cost of $1,600. Perspective elevation and floor plans.
5. Two floor plans and perspective view of a mountain cottage in Massachusetts designed by the late H. H. Richardson. Cost $10,000.
6. View of the Drexel Institute of Art, Science, and Industry, recently erected at Philadelphia, at a cost of $600,000.
7. The Parsonage of the First Baptist Church at Gardner, Maine. Cost $2,500 complete. Perspective and floor plans.
8. Ground plan and perspective view of the First Baptist Church recently erected at Gardner, Me. Cost complete, $8,000.
9. A residence at Bridgeport, Conn. Cost complete $3,400. Perspective and plans.
10. View of the German House in Chicago.
11. A church recently built at Oneida, N. Y. Cost $2,400. Floor plan and perspective.
12. The beautiful residence of Geo. C. Hollister, Esq., at Rochester, N. Y. Mr. James Cutler, architect.
13. The World's Columbian Exposition—making of staff decorations.
14. Miscellaneous contents: Durability of redwood.—Is iron rust a cause of fire?—Types of chairs, old and modern, illustrated.—How to build a rain water cistern and filter, illustrated.—Bird tracks in stone.—Reparation of zinc castings.—Still water mains in Toronto.—The builder of the White House.—What constitutes the best paint.—World's Fair notes.—A heavy standard moulder, illustrated.—A staircase and hall design, illustrated.—Hot water *vs.* steam heating.—Schmidt's improved window frame, illustrated.—Value of thoroughness.—Improved Warner door hanger, illustrated.—An improved band scroll and resaw, illustrated.—Artificial stone.—An improved flour bin and sieve, illustrated.

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Business and Personal.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3860) A. T. S. asks: 1. In transferring pictures from paper to wood for re-engraving by the mode described in Moore's Universal Assistant, page 547, I find that it destroys the colored inks, leaving the paper plain, with nothing to transfer except the black, which seems to work all right. What is the reason, and is there a way to do this? A. You might try the varnish tranferring process. Varnish the block, soak the print in water. While the varnish is still tacky, smoothly rub on the print and let it dry. Then rub off the paper with the wet finger. 2. On page 551 same book, under the heading "To print a picture from the print itself," what form of potassa is meant? I could not make it work with caustic potassa. Does it need any particular kind of ink? I used common printer's ink. A. Use lithographer's ink. Caustic potash is meant. To three parts solid tartaric acid use one part caustic potash. In our SUPPLEMENTS you will find many processes of photographic reproduction described. These are the most reliable and generally used methods. Photography is also extensively used to reproduce a picture on the block for engraving.

(3861) E. H. says: My radiating steam coil showed some new feature—new to me. Having occasion to open valve under supply tank, the steam with condensed water, instead of blowing out, went direct back into boiler, making a roaring noise. There was 5 pounds pressure at the time. Can you explain? A. Your boiler had a partial vacuum instead of a pressure of 5 pounds. Your gauge must have been out of order. Boilers used for low pressure heating with a closed return circulation often have a vacuum when the steam goes down, because the condensation is greater than the supply from the boiler. 2. An inch pipe set vertically filled with water, will give how much pressure at bottom, height 60 feet? A. The pressure at bottom of pipe will be 25·8 pounds per square inch.

(3862) W. W.—The article to which you refer states that the roots of *Abrus precatorius* "afford licorice, which is extracted in the same manner as that from the true Spanish licorice plant, the *Glycyrrhiza glabra*." The Spanish method of making extract of licorice is as follows The roots of the *G. glabra*, after having been dug up, thoroughly cleaned, and half dried by exposure to the air, are cut into small pieces, and boiled in water till the liquid is saturated. The decoction is then allowed to rest, and, after the dregs have subsided, is decanted, and evaporated to the proper consistency. The extract, thus prepared, is formed into rolls from five to six inches long by an inch in diameter, which are dried in the air.

(3863) S. B. asks: 1. What is the rule for determining the increase of speed or force of discharge from the nozzle of a pipe, in accordance with its decrease in diameter, from the main pipe? A. The relative height of a jet from a nozzle increases with its size, with the same pressure at the butt. When a pipe or hose intervenes, the relative height depends upon the friction in the main pipe and hose, and also upon the kind of surface on the inside of the hose. The subject is fully explained, with tables of loss of head by friction, and the height of jets for given pressures, in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 791, 792. Also in Ellis' work on "Fire Streams," $1.50 mailed. 2. Is air in motion, *i. e.*, wind, colder than when at rest, comparatively? A. Air in motion is not necessarily colder than when at rest, but has more power to absorb or carry away heat from the body by convection, or by a more commonly expressed term, wiping the heat away. It also greatly assists evaporation of moisture from the body, with consequent chilling.

(3864) T. J. H.—If, as you say, you have a great deal of leisure time at your disposal, and wish to study pharmacy, we would advise you to make an arrangement with some pharmacist of your town whereby you can spend a few hours a day in his store to obtain practice and instruction. Good books for you to read would be the "United States Dispensatory" and "Parish's Practical Pharmacy." We can furnish you with the former at $8.00 and the latter at $6.00.

(3865) J. H. D. writes: 1. Is acetate of soda a costly product? A. No. 2. After having absorbed water, does it generate a great degree of heat? A. No. 3. Can it be used more than once? A. Yes. 4. Does it evolve a gas while generating heat, and if so, what kind? A. No gas is evolved. The action of acetate of soda (sodium acetate) is based on the doctrine of latent heat. The salt, if heated, dissolves in its water of crystallization. In the heating process it becomes warm enough for use in foot warmers, etc. Then, as the temperature falls a little, the salt again solidifies, and gives off its latent heat of fusion, thus prolonging the period of usefulness.

(3866) G. O. S. writes: 1. In regard to the dynamo described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 600: According to the author, it is an eight-light dynamo; could it not be used on one light of 8 times the power? A. The dynamo may be run in the manner proposed. 2. What changes, if any, would be necessary to use it for plating purposes, and would it work well as a plater? A. For changes required to convert the dynamo into an electroplating dynamo we refer you to SUPPLEMENT, No. 793. 3. Can you inform me where I can get a book which teaches all about brazing, the blowpipe, etc.? A. You will find instructions on brazing and soldering in SUPPLEMENT, Nos. 20 and 187.

(3867) J. C. C. asks: 1. Is there any theory as to why the sun and moon appear larger near the horizon than elsewhere? A. The theory of the apparent enlargement of the sun and moon at the horizon is that their light passes a greater distance through the atmosphere than at higher elevations. This causes an increased refraction, tending to enlarge the solar and lunar image, and acting as a great spherical lens at a near distance at noon and a greater distance at the horizon. 2. Why is there no dew on the morning of a cloudy night? A. Dew is caused by the radiation of heat into space during clear nights. This is prevented by clouds, which act as a great blanket, tending to retard radiation. The cold earth surface induces condensation from the moist air in the form of dew, much as an ice pitcher condenses the moisture of the air upon its cold surface. 3. Is it true that there has recently been discovered an element lighter than hydrogen? A. No.

(3868) C. Y. says: An argument arose as to the value of a silver dollar, that is, the intrinsic value of the component parts at the time of issue. A. The present value of the silver dollar is 73·8 cents in gold, the price of pure silver bullion being 95½ cents per ounce in gold. There are 371¼ grains of pure silver in a dollar, the ounce being 480 grains. The quotation of silver bullion at 1·292 per ounce is based on the value of the pure silver in a dollar.

(3869) T. T. asks: Can you inform me how to clean the slime and filth from a waste pipe that carries off soapy water from a wash sink? It is 1¼ inch iron gas pipe and cannot be got at, only at the inlet and outlet. Is there a chemical that will do the work? A. If the pipe is entirely closed, there is no chemical that will open it, but if there is still an opening through it, a hot solution of lye poured into the pipe may clear it out. This preparation comes in pound packages and can be bought at any grocery. If the pipe is closed, and you could work a wire through so as to run in the lye, it might do the business. True caustic potash is far superior to the "lye" sold in the groceries. The name "caustic potash" is often printed on the labels of packages of caustic soda. You must get the real potash at the drug stores.

(3870) H. C. W. asks: How to braze band saws, with fine brass wire, and hot tongs, the best kind of acid, and how to place the wire between the joints, how hot to get the tongs so as not to burn the saws? A. Use the thinnest sheet brass or silver, about No. 30 wire gauge, for brazing band saws with hot tongs. Scarf the broken ends ¼ to ⅜ inch back and lap ½ an inch with a slip of the thin brass or silver between, well boraxed by rubbing the borax on the surfaces and add a little powdered borax to make sure. Fix the ends of the saw in a forked frame or block of wood by clamps in its proper position, so that it can easily be gripped by the tongs. Make the jaws of the tongs so that they will close fairly upon all parts of the lap. Heat to a bright cherry red and apply quickly and carefully; hold until the solder is fused; squirt a little water between the jaws to set the joint, when the tongs can be taken off. The extra thickness made by the lap should be carefully filed to gauge thickness, and if a kink is made, it may be straightened by hammering on a face-block.

(3871) G. R. F. writes: The following is a way to wind the uncovered wire on the secondary coil in an induction bobbin by hand, as not all amateurs have the opportunity of using a lathe, according to Hopkins' "Experimental Science," and which I found easy enough. Procure cotton thread a little thicker than the size of the wire, winding it together with the wire on the spool, taking care that the thread and wire do not get twisted together, but run on the spool one parallel to the other, so that the cotton thread will always keep the two adjacent wire spirals on the spool separate. A little crank made of three pieces of wood, to turn the bobbin, will do for the lathe. I used to dip the cotton, before using it, in varnish or shellac.

(3872) F. W. S. asks (1) if an oil atomizer will do for soldering as well as a gas blowpipe. A. An oil atomizer is not suitable for an ordinary blowpipe; there is no control over the blowpipe flame. 2. If brass can be soldered to cast iron, and what is the best solution to use? A. Brass can only be soldered to cast iron by first cleaning and tinning the cast iron surface, which must be made clean and slightly rough with a file and tinned with a copper, using sal ammoniac on the copper and iron with pure tin. If the iron is large, it should be heated other than by the copper.

(3873) H. B. L. asks whether or not there is a metal or composition that is black all through. Can phosphor bronze be made black? A. Black is due to the incapacity for reflecting light. No metal can be said to be truly black. Bronze is not black, and cannot be made really black except by some superficial treatment. Unpolished planed cast iron is often nearly black, owing to graphitic carbon contained in it.

(3874) J. E. A. writes: What is the best poison for poisoning wolves? I have been using strychnine, with poor success; they detect the poison, and will not eat meat that contains it. A. Strychnine is the generally accepted poison. You may not conceal it properly. Insert it in gashes or within lumps of meat, so that the meat will be eaten without the bitter taste being perceived.

(3875) A. M. writes: I see large amounts of celery which do not appear to be whitened in the usual manner by blanching, but is white all over as if by some bleaching process. Please can you inform me through next paper what is that process? A. No process is used beyond the ordinary blanching by covering with earth. Boards are sometimes placed roof fashion over the tops. The variety of the celery may have something to do with it. There is what is known as self-bleaching white plume celery, which gives very white stalks.

(3876) C. S. B. asks: How are torpedoes made? Such as used by children on the 4th of July. A. By inclosing a little fulminate of mercury mixed with gravel in tissue paper twisted up as nearly spherical as possible.

(3877) M. L. M. asks: How many horse power would an 18 foot overshot wheel give with 50 miner's inch of water running on it? Also what would 100 miner's inch of water running on it give? A. 2⅛ horse power and 5¼ horse power.

(3878) F. G. B. asks: Will you please tell in your answers to correspondents of a simple method for determining whether water from a driven well is fit for drinking and cooking purposes, and can be used in a steam boiler to run an engine without injury to the boiler? A. There is no simple way. If the water is placed in a glass and some white sugar is dropped into it and all is left at rest, the appearance of a colored deposit near the little pile of sugar is supposed to indicate a bad water. But the water can be bad without this happening. For boilers the addition of three volumes of alcohol should produce no precipitate (calcium sulphate), and on boiling no precipitate should appear (carbonates). These tests are also far from complete.

(3879) H. M. W. asks: 1. Is it possible to burn water? That is, to decompose it into inflammable gases so suddenly that it might be said to burn. If so, how is it done? A. Water can only be decomposed into hydrogen (inflammable) and oxygen (non-inflammable). Burning, in general terms, is the combination of an inflammable with a non-inflammable gas. Therefore water cannot be burned. Its decomposition is the exact opposite of burning. 2. Are there any furnaces where a temperature of 3,000° Fah. is attained? A. Undoubtedly this temperature is attained in many blast furnaces. It is probably vastly exceeded in the electric arc, and in oxyhydrogen gas furnaces.

(3880) H. W. B. writes: A crew can row at the rate of 12 miles per hour in still water. It takes them 7 hours to row up a stream a certain distance, and 5 hours to go down a certain distance; at what rate does the stream flow? A. Let x=rate of stream. Then from the conditions of the problem we have: $7(12-x)=5(12+x)$, and solving $x=2$ (miles per hour).

(3881) B. H. says: Please explain through your columns your reason for answer to query 3690. I would also like to hear opinions from people who have used the cure. A. Singeing is now used in barber shops, and as a source of income any new fad is favored, even if a bald head gets burned. We have no experience.

(3882) G. M. asks (1) how to make a small balloon rise in the air. A. By filling it with coal gas or with hydrogen. 2. Will common gasoline do? A. No. 3. Will a pump be needed to pump the gas into the balloon? A. If the balloon is of India rubber, pumping is needed to cause it to expand; but with ordinary cloth balloons no pumping is needed, the pressure in an ordinary gas main sufficing.

(3883) G. V. says: I have a grain crusher with two cast iron rollers. They have a few small holes, air holes I would call them. Of course grain when passing between the rollers is not crushed when opposite the holes. Is there a composition or cement they can be filled with? A. There is no cement that will stand the wear. Drill holes a little larger than the blow holes, fit iron plugs that will drive snug to the bottom, wetting the plug with a solution of sal ammoniac in water. Finish the top of the plugs even with the surface of the cylinder.

(3884) H. M. R. asks: Can you inform me in what shape rye bread is used to clean wall paper? I have seen some work done with it and am anxious to learn how. A. Use the soft inner portion of the bread. It should be applied to the wall with a rolling motion.

(3885) S. C. asks: We have tried, for the removing of typewriting from paper, your suggestion (3533) to M. B. K., in your paper of October 24. All your remedies failed. So could you tell me something else? A. Try javelle water or alcoholic solution of caustic potash. Success is very doubtful.

(3886) C. H. H.—Glass will expand and contract under changes of temperature.

(3887) G. H. W. asks: Which is the more necessary for a mechanical engineer, machine shop practice or foundry practice, where only one can be had? A. Machine shop practice is most essential in the education of a mechanical engineer. Foundry practice not so much so, yet is sometimes a great help as a guide in constructing patterns for machinery.

(3888) E. P. H. asks: Is the lateral pressure greater on a stand pipe 1 foot in diameter filled with water and 100 feet high than on a pipe 1 inch in diameter and same height? A. The pressure is no greater per square inch of surface for a given height, whether the pipe be large or small. The strain tending to rupture or split the pipe increases with the diameter, or is 12 times greater in the large pipe, as above stated.

(3889) C. E. H. says: We would like to ask if you can tell us why the water drawn from our hot water spigot should have a milky white appearance When it is first drawn the discoloration is very marked, but after it is allowed to stand a few minutes it becomes perfectly clear, excepting that at times we can discern small white sediment in the bottom of the vessel. We use Philadelphia city water and our plumbing consists of lead pipe throughout. We have a galvanized iron circulating boiler and we notice that it is only the hot water, that is the water which has passed through this boiler, which is discolored. Can you tell us the cause of the trouble and suggest a remedy? Also would this water be injurious to health if used for cooking purposes? A. The sediment from the hot water faucet may be oxide of zinc, derived from the zinc in the galvanized iron boiler. Clean out the boiler thoroughly, which may stop it. There is some danger of poisoning. The only remedy is to put a copper boiler, tinned upon the inside, in place of the galvanized iron one.

(3890) M. A. R. says: I wish to find out more concerning bismuth than can be found in the encyclopedia, of the commercial value, the supply and demand, both here and abroad, the uses, etc.? A. The supply of bismuth is limited and derived mostly from Germany, with small quantities from England, Norway and Siberia. It is largely used in type metal, and in the arts. Present price $2.40 per pound. It is not yet mined in the United States, although known to exist in Utah, Colorado, Arizona, California, and Alaska. The localities discovered do not assay in paying quantities at present. Books on chemistry treat of the chemical relations only.

(3891) G. H. asks how to construct an armature for electro-plating to fit in the same place of the eight light dynamo as described in SUPPLEMENT, No. 600. I have got the dynamo all complete, including the armature, but I want to make an armature to slip in its place for plating. Please state size of wire, number of coils, number of layers in each coil, number of convolutions in each layer. Would an armature give best results as described in "Experimental Science," page 495? A. The information you require is given in full in SUPPLEMENT, No. 793.

(3892) L. D. asks: 1. Could I make an induction coil by following the instructions in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, if I use No. 36 double silk covered copper magnet wire and wind it straight across instead of using bare wire and winding it in sections? A. You could wind a coil in that way, but it would not be as efficient as one wound in two sections. The silk covered wire is better than bare wire. 2. What kind of wire would be best to use, that is, which will give the best results, bare wire, single or double silk covered, and how should it be wound? A. See answer to No. 1. 3. If I cover each layer of the secondary coil with one or two thicknesses of silk, would it not be as good as varnishing each layer? A. Silk is not as good as varnished paper for this purpose. 4. Would it not be better to make primary coil of four layers instead of two? If not, why? A. Two layers are better than four, as it allows the secondary wire to lie nearer the core and also permits of a greater number of convolutions of the secondary with the same length of wire. 5. If I make an induction coil with four layers of No. 16 wire for primary, and wind on for secondary coil to 3¾ in. in diameter, No. 36 double silk covered copper magnet wire, straight across, would it give as good results as the one described in SUPPLEMENT, No. 160? A. No; see answer to No. 1. 6. About how large a spark would such a coil give? A. The coil described in the SUPPLEMENT referred to is capable of giving a spark 1½ inches long. 7. Would it do to have the same sized condenser and core in making such a coil? A. Yes. 8. How much wire would I need? How many pounds for primary, and how many for secondary coil? A. About ½ lb. for the primary and 2 lb. for the secondary.

(3893) C. E. B. asks: Who is the greatest electrical inventor? I say that Sir Wm. Thomson is the greatest, and H. says that Edison is the greatest, and T. says that Prof. Elihu Thomson. Now, which of these three great men have the most inventions that they have made by their individual selves. Also please answer the following: H. and T. say that the core of a magnet has electricity in it. I say it is magnetism, and not electricity. Please inform us on the matter. A. It

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is manifestly out of the question for the editor of Notes and Queries to decide as to the comparative greatness of these men. They are each great in their way, and they differ so much in their respective lines of investigation as to render a comparison impossible. In regard to the magnet question, you are both right. The magnet core becomes magnetic when the current passes around the bobbin, and the current also induces a momentary current in the iron of the core when the circuit is closed; also when it is opened. The current thus induced, however, is not useful, but detrimental.

(3894) G. R. R. writes: I want to make two bells for a line three blocks long, ground wire at each end, No. 16 line wire galvanized. What will be the best, one coil or two to each bell What number wire and how many feet to the coil, to be used with a push button? A. Use a U-magnet with two bobbins. No. 24 magnet wire will answer. You will require 125 feet on each magnet. While No. 16 wire will answer for the line, No. 12 would be preferable, as it offers only half the resistance.

(3895) B. H. F. writes: I would like to know how much wire, iron, etc., it will take to make a small dynamo for shocking purpose? A. Make a magneto using a compound permanent U-magnet for a field magnet. Use a U-electro magnet for an armature. It should be wound with about 500 feet of No. 36 copper magnet wire.

(3896) J. S. asks: 1. In a telegraph sounder for a line of 500 ft., how much and what size wire will the magnets need, and the height and diameter of magnets? A. Use about 125 ft. of No. 24 magnet wire, make the cores of ⅜ iron, each 1½ in. long. The diameters will be about 1¼ in. 2. Should Norway iron be used for armature and core, and size of core? A. It would be best, although common American iron will answer if well annealed. 3. Will brass or copper do for the contact points on key in place of platinum? A. Yes; but either will soon corrode.

(3897) R. H. M. writes: Allow me to add my mite to the storage battery. Inclosed find sample of punching. The lead is 1-18 in. thick, sizes are 2 by 4⅛, and when punched and filled with red lead they are folded to make 2 by 2 in., four plates to the cell, six cells to the box, ten boxes to the battery, connected to a roller. Charge in multiple arc, discharge in series, and by little switches on the multiple side of the roller I can have any number of large cells. Prefer large plunging cell to charge with. Gravity gave me too much trouble. What do you think of the style of punching? A. The sheets of lead are punched so as to tubulate them on the outside. This form of plate is effective, but not new. The best practice is to charge storage batteries in series.

(3898) A. H. H. writes: About two or three years ago I tried to run our sewing machine by electricity, constructed three large plunge batteries with two gallon cells, used a ⅛ h. p. C. & C. battery motor. They ran the machine powerfully at first, but run down in about three hours, using six pounds bichromate soda and 9½ qts. sulphuric acid. Expense about twenty-five cents an hour. For the last year I have used two small storage cells, charged by eight Gethins' gravity batteries in series. They remain in connection with the storage cells (in house cellar), from which wires run up to the sewing room above. There has been plenty of power at all times to run sewing machine, and for experiments, running a medical coil with resistance between, etc. The gravities have not been recharged, and now at the end of the year there is plenty of blue vitriol and zinc in the jars. The only trouble is there is copper deposited on the bottom of the porous cells, which I do not know how to get rid of. The expense has not been one cent a day, unless the porous cells are spoiling from the deposition of copper. A. Both storage and primary batteries have done remarkably well. You could remove the copper by means of nitric acid, but the cost would probably be as great as that of new porous cells.

(3899) W. L. C. asks as to the method of making petrolatum of any desired melting point, that will remain smooth and not become granular. By mixing paraffine wax and fluid petrolatum by the aid of heat, a compound is obtained which remains smooth for a week or so. A. Simply melt the two constituents together on a water bath. If this does not give a satisfactory product, try the addition of a little oil of sweet almonds, or even sweet oil or cotton seed oil.

(3900) W. O. D. asks: Why does plunging a red hot iron into a weak gravity battery revive it? A. Any slight revival would be due to the increase of temperature. The chemical status of the battery is unaffected.

(3901) E. O. writes: 1. Referring to electric motor in SUPPLEMENT, No. 641, of April 14, 1888, would it have sufficient power to propel a small boat, say about twelve feet long? A. The motor referred to will run a boat of the length mentioned. 2. What would be the proper size of screw to put into a boat of that size? A. The screw should be a two or three bladed one of eight inches diameter. The motor should be geared by a belt or gearing, so that it will make about four revolutions to one of the screw. 3. Could the power of the motor be increased by adding more cells or would a larger motor have to be made? A. The power of the motor can be increased by adding more cells. 4. What is vulcanite? A. Vulcanite is hard vulcanized rubber. 5. Have you any back SUPPLEMENTS, giving directions for making small electric boats for amateurs? A. Consult SUPPLEMENT, Nos. 362, 558, 706, 786, 815. These do not apply to amateurs only, but will be useful.

(3902) R. E. M. says: I would like to ask through the columns of your valuable paper, Is there any kind of gas gun in practical use? One which uses coal gas as an explosive. Please give a description. A. There are no gas guns in practical use. We doubt if a practical one has been invented.

(3903) F. McK. asks: 1. Would a drum armature used on the simple electric motor be as efficient as the one described? A. Yes. 2. With cast iron field magnets, what would be the E.M.F. and amperage, when used as a dynamo? A. Withoutsome calculation, this would be a matter of conjecture. If wound according to the directions for the motor, it would probably yield a current of two or three amperes, having an E.M.F. of eight or ten volts. 3. Is a battery connected to give 16 volts and 4 amperes, the best arrangement for the motor? Would not a battery giving 8 volts and 8 amperes run it as well? A. If the motor is wound with coarse wire, the latter would be preferable. 4. What is the speed of the motor with eight cells of plunging bichromate plates, six by ten inches? A. About 2,500 revolutions per minute.

(3904) C. Y. writes: In your answer to No. 3725, SCIENTIFIC AMERICAN, December 12, 1891, page 378, you say that an induction coil cannot be used for lighting an incandescent lamp. Will you please state the reason why? Is not the electricity the same as from a dynamo? A. Electric lighting is effected by heat. To secure a sufficiently high temperature in an incandescent lamp to render the carbon filament highly luminous, the filament must be small enough to offer sufficient resistance to the current to cause it to become heated; or, to state the case in another way, the current must be so great as to be incapable of passing through the lamp without heating the carbon filament. The electromotive force of the current from an ordinary induction coil is very great, say from 10,000 volts up, sufficient to carry it through a large number of lamps; but the current is deficient in amperage or quantity, the amperage being infinitesimal, so that the carbon filament forms a comparatively good conductor for it, and is therefore not heated by it.

(3905) C. L. W. writes: 1. I am constructing a simple electric motor after the one described in SCIENTIFIC AMERICAN, of March 17, 1888, and would like to know whether, in the armature core, as my No. 18 wire is in three pieces, the ends must actually be in electrical connection (must they touch)? A. It is not necessary to have the wire of the armature core continuous. 2. Must the ends of the Russian iron actually touch? A. It is not necessary. 3. Will twelve convolutions of Russian iron do for the field magnet? A. Follow the instructions given in the article referred to, or, better, in SUPPLEMENT, No. 641.

(3906) N. E. W. asks: How many h. p. will a spur wheel 9⅝ in. in diameter, 1⅛ in. pitch, 4½ in. face, 288 revolutions transmit? How many revolutions is the safety limit to run a fly wheel 7 ft. in diameter, 6 armatures, weight about 3,200 lb.? A. The pinion should transmit from 60 to 70 horse power. If the flywheel is soild and of good sound metal, it should be safe at 200 revolutions per minute.

3907) J. S. asks: 1. Is the application of electrical power to the propulsion of railroad trains feasible? A. It is thought feasible by several of our great electrical inventors. 2. If so, what hinders the adoption of same? A. The lack of a practical demonstration showing it to be an improvement over the present system. 3. Is it applicable to the propulsion of light trains of mail and express matter? A. Yes. 4. What would probably be the effect of the adoption of this last on the railway mail service? A. It would be impossible to predict.

(3908) G. G. asks: 1. The large size Edison-Lalande battery described in SUPPLEMENT of March 7 is rated at 900 ampere hours. Does this mean that the cell gives a total of 900 amperes in fully exhausting its elements, or that it will keep up a constant flow of one ampere for 900 hours? A. Either would be correct. 2. What is meant by ampere hours? A. The equivalent of one ampere of current for one hour. Thus: one ampere for one hour is one ampere hour, one ampere for two hours is two ampere hours, two amperes for 1 hour is two ampere hours, one-half ampere for four hours is two ampere hours, etc. 3. If an Edison incandescent 2 C. P. lamp is rated resistance 4 ohms, E.M.F. 5 volts, amperes 1¼, how long would above battery run it (if it had sufficient voltage)? A. Divide 900 by 1¼ and you have 720, which is the number of hours your hypothetical battery should run the lamp.

(3909) C. E. W. says: The water in our recently finished cistern is hard and, of course, tastes of the cement. Can you, through your valuable paper, tell me what will make the water soft, and also what will destroy the taste of the cement? A. As to the water now in the cistern, nothing can be done to destroy the taste of the cement or make the water soft, Empty the cistern of its present supply and the water hereafter will be but little, if any, affected by the cement.

(3910) W. A. S. asks: How can I learn engraving? Would I have to commence as an apprentice in an office where engraving is done? Or could I learn from books? How long does it take one to become a fair average engraver? What pay do they receive? A. There are two principal divisions in the art of engraving, both paying well to persons attaining proficiency. Both can be partially learned from books and persistent practice. For wood engraving, we recommend "Hand Book of Wood Engraving," $1 mailed. For copper plate engraving a book on "Practical Instruction in the Art of Letter Engraving," $2 mailed. For etching we have "Lalande on Etching," $3.50 mailed. If you are ingenious and well up in draughting, you can make much progress alone.

(3911) S. A. U. says: A B and C argue on the principles governing the flow in artesian wells. A says that the water from a well will rise as high as the surface of the body of water that furnishes the supply for the artesian well basin if there are no other outlets, B, that it will rise less, owing to gravity and friction. C claims it will rise to a higher point, on account of a small outlet to the great pressure of a large body of water. To illustrate, A says, take a barrel filled with water and attach a hose to a hole in the bottom of the barrel, raise the hose outside of the barrel, and the water will stand as high in the hose as the surface of the water in barrel. B says it will stand lower in the hose, owing to gravity and friction, and C claims the water water rise to a higher point in the hose on account of the great pressure from the large body of water in the barrel. A contends that it is according to the law of gravitation that water will seek its level, that friction does not exist, as the question is, how high the water will rise, not flow; that the surface of two bodies of water connected below the surface will rise to the same level, regardless of their comparative bulk, and if C's position was correct, then was perpetual motion discovered. Who is correct? A. A is correct every time. B would be correct, if the water was discharging at a lower point than the original head, when gravity would make it flow, and friction would retard the flow. C can take lessons from A.

(3912) R. E. F. asks: 1. How to work hard rubber in the manufacture of very small articles in your valuable paper, the SCIENTIFIC AMERICAN. How is it made from rubber? A. The process of preparing rubber for vulcanization, and the various steps in the manufacture of hard rubber articles, would require a description which would be longer than is desirable for these columns; however, the process of preparing the rubber for vulcanization is in brief as follows: The pure gum rubber is macerated with sulphur and a pigment of the required color, and rolled out into sheets. 2. How to form small articles from hard rubber? A. The prepared rubber is pressed into moulds of plaster of Paris or metal and subjected to steam heat under pressure. The time required for vulcanization varies from one to several hours, according to the preparation of the rubber and the temperature to which it is subjected. You will find much on this subject in SUPPLEMENT, Nos. 249, 251 and 252.

(3913) C. H. H. asks: 1. In the process of manufacturing kid leather from sheep skins, it is necessary to remove the animal grease from the skin before it is tanned. Can you inform me of any substance that will do this, and not injure the elasticity of the skin? A. A volatile solvent, such as light naphtha or bisulphide of carbon, is about the best we can recommend. Steam heat, with wringing out, is also employed. 2. Can you inform me of any chemicals that contain the same properties as the yelk of one egg? A. It is supposed that vitellin, the characteristic constituent, is a mixture of albumen and casein. But this is a very incomplete statement, and the yelk of the egg has never yet been synthesized.

(3914) G. A. D. asks: 1. How many molecules of air are supposed to be in a cubic inch of air? In figures and in words (thus 10,000,000 = ten million). A. According to J. Clerk Maxwell, a cube, each of whose edges is 1-4000 millimeter can contain from 60 to 100 millions of molecules of oxygen or nitrogen, virtually of air. Reducing this to one cubic inch, we have 60,000 to 100,000 trillions, a trillion being represented by 1 followed by 18 ciphers. In powers of ten the molecules per cubic inch would be from 6×10^{22} molecules to 10^{23} molecules. 2. How many in a vessel of one cubic inch internal capacity when exhausted to one millionth of an atmosphere? A. One millionth the above amount or 6×10^{16} molecules to 10^{17} molecules. 3. If I take a glass tube sealed at one end, 16½ inches long and 3-8 inch internal diameter, therein place a glass rod 3-16 inch diameter and 15¾ inches long, this rod will naturally displace a certain amount of air molecules. If in this condition I attach the open end of the tube to an air pump and exhaust it to one millimeter of mercury of the barometric gauge attached to air pump, how many molecules will there still be left in the tube? A. From 182×10^{18} to 109×10^{18} or 182 trillions to 109 trillions.

(3915) G. M. A. says: If a gun be charged with powder to drive the ball at the velocity of a mile a minute at the instant the ball is freed from the gun, supposing the gun to be fired while stationary (not the velocity sufficient to carry the ball a mile in distance in a minute, but the rate of a mile a minute at the time it is freed from the gun) if the gun so charged be placed on a train moving at the velocity of a mile a minute, and be fired in the opposite direction from that in which the train is moving, how far will the train and ball be apart at the expiration of one minute, the train continuing to move at the same rate? If the gun is fired in the same direction the train is moving, how far would the ball and train be apart in one minute? Would the ball be in front or behind the train? A. If fired from the rear of the train, the ball would fall vertically to the ground, and in one minute the train would be one mile distant from it. If fired from the front of the train, the ball would strike the ground in advance of the train, at a distance due to its initial velocity and varying according to its height from the ground, which latter datum is not given. As it would presumably reach the earth in less than a second, and not over one hundred feet in advance of the train, after one minute the train would be nearly a mile in advance of the point where it would reach the ground.

Replies to Enquiries.

The following replies relate to enquiries recently published in SCIENTIFIC AMERICAN, and to the number therein given:

(3794) O. O. E.: I give you a working process for hardening wax for mechanical uses. Melt the wax and add to it hot calcined plaster or any of the ochers previously heated. The amount used depends upon the quality of the wax. The addition of resin will increase the hardness. This mixture can be cast, wrought with a knife, chisel or a saw, or turned in a lathe. In fact it can be used for a variety of useful purposes.—ALFRED C. POPE.

J. D. F. asks how to dye cloth.—J. F. T. asks (1) for an emulsion of cod liver oil, (2) for a pad for rubber stamps.—C. D. asks how to polish horns.—J. W. L. asks for wood fillers and stains.—T. J. A. asks for practical directions for nickel plating.—W. H. K. Jr., asks for a waterproof glue.—H. C. B. asks how to make rubber stamps.—R. B. asks for a window cleaning compound.—Constant Reader asks for (1) an ink eraser, (2) vanishing ink, (3) hair tonic.—C. E. S. asks for cements to adhere to smooth surfaces.—J. F. D. asks for detailed instructions in electroplating with silver.—F. E. B. asks how to keep cider sweet.—J. B. B. asks how to mix a paint for vessels, and for a waterproof cement.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column.

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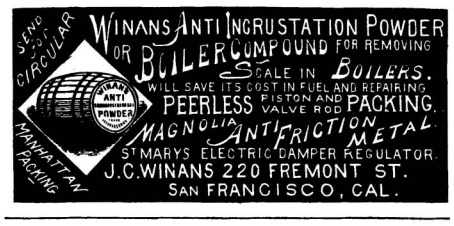
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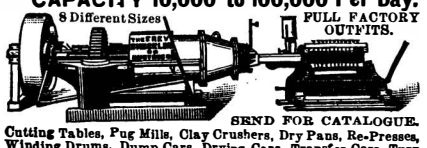

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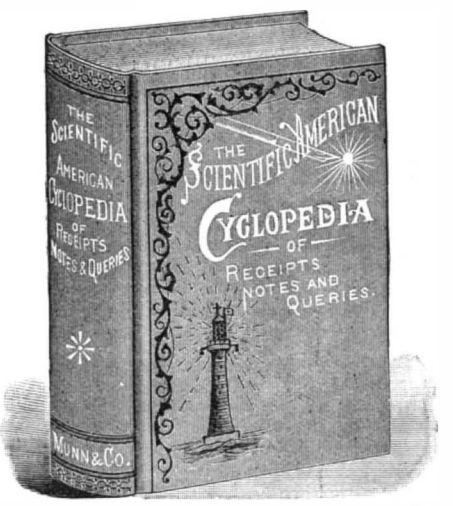

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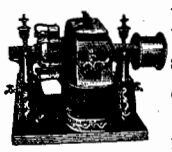

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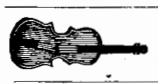

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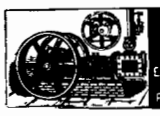

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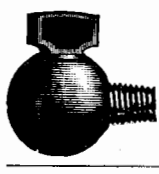

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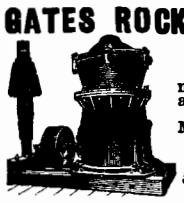

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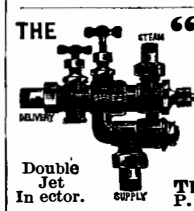

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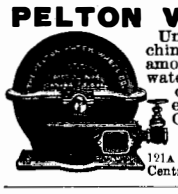

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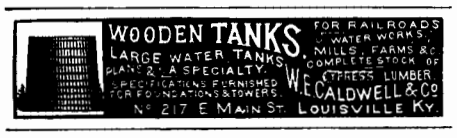
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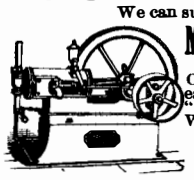

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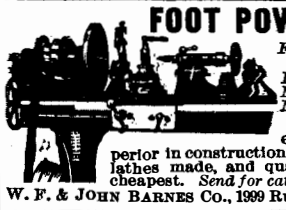

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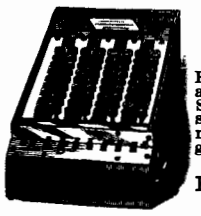

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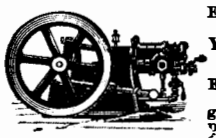

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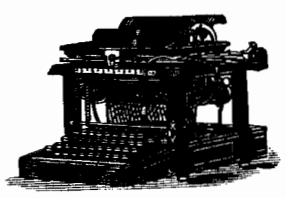

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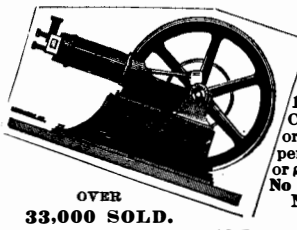

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